



BIONETICS

Summary of mutagenicity screening studies, host-mediated assay cytogenetics dominant
lethal assay-Contract FDA 71-268 & Compound FDA 71-40 (Dilauryl Thiodipropionic
Acid)
3/7/73 (Revised: 11/1/73)

HOST-MEDIATED ASSAY
CYTOGENETICS
DOMINANT LETHAL ASSAY

FDA 71-40

Dilauryl Thiodipropionic Acid
Contract FDA 71-268

330

7315 Wisconsin Avenue
Bethesda, Maryland
20014

J30

SUMMARY OF MUTAGENICITY
SCREENING STUDIES

HOST-MEDIATED ASSAY
CYTOGENETICS
DOMINANT LETHAL ASSAY

FDA 71-40

Dilauryl Thiodipropionic Acid
Contract FDA 71-268

SUBMITTED TO

Food & Drug Administration
Department of Health, Education and Welfare
Rockville, Maryland

SUBMITTED BY

Litton Bionetics, Inc.
7315 Wisconsin Avenue
Bethesda, Maryland
March 7, 1973

(Revised November 1, 1973)



BIONETICS

March 7, 1973

Mr. Leonard Appleby, Contracting Officer
Department of Health, Education & Welfare
Public Health Service
Food & Drug Administration
CA-212
5600 Fishers Lane, Room 5C-13
Rockville, Maryland 20852

Reference: Contract FDA 71-268

Dear Mr. Appleby:

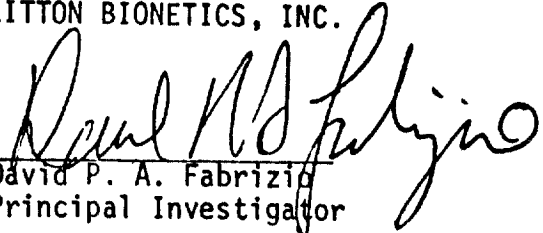
Enclosed is the report of the mutagenicity screening studies conducted on FDA compound 71-40 Dilauryl Thiodipropionic Acid under the above referenced contract.

Included in this report are the results and raw data of the three tests conducted, the Host Mediated Assay, the Cytogenetic Studies and the Dominant Lethal Assay. Three(3) copies are being submitted for your review.

If there are any questions concerning this submission, or if additional information is required, please do not hesitate to contact me.

Sincerely yours,

LITTON BIONETICS, INC.


David P. A. Fabrizio
Principal Investigator

DPAF/vy
Enclosure



BIONETICS

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	(Submitted Separately)



BIONETICS

I. REPORT

A. Introduction

Litton Bionetics, Inc. has investigated the possible mutagenicity of compounds selected and provided by the Food & Drug Administration under Contract 71-268. LBI's investigation utilized the three mammalian test systems herein described--Host-Mediated Assay, Cytogenetic studies and Dominant Lethal Assay. These tests provide information as to the types of genetic damage caused by environmental compounds -- pesticides, chemicals, food additives, drugs, and cosmetics.

The Host-Mediated Assay is based upon the assumption that the action of a mutagen on the genetics of bacteria is similar to that in man. This is further strengthened by the use of an eukaryotic organism (e. g., Saccharomyces cerevisiae). Since the mutation frequencies are well established for the indicator organism, any deviation due to the action of the test compound is readily detectable. As some compounds are mutagenic in bacteria and not in the host animal, and vice versa, this test is able to differentiate an action which may have been due to hosts' ability to detoxify or potentiate a suspected mutagen. This action is dependent upon the ability of the compound to gain access to the peritoneal cavity. Coupled with the direct action of the compound on the indicator organism in vitro, the assay provides a clear insight into host mediation of mutagenicity.

Cytogenetics provides a valuable tool for the direct observation of chromosomal damage in somatic cells. Alteration of the chromosome number and/or form in somatic cells may be an index of mutation. These studies utilized examination of bone marrow cells arrested in C-metaphase from rats treated with test compound as compared to positive and negative control animals. If muta-



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tional changes occur the types of damage expected due to the action of chemicals are structural rearrangements, breaks and other forms of damage to the chromosomal complement of the cells exposed.

For the in vitro cytogenetic studies, we have a more rapid and inexpensive means of determining chromosomal damage. This is accomplished by observing cells in anaphase. As the chromatids separate and move along the spindle, aberrations may occur. Chromatids which do not migrate to the daughter cells may lead to uneven distribution of parts or of entire chromatids (mitotic nondysjunction). These give rise to "side arm" bridges which have been interpreted as point stickiness or localized failures of chromosome duplication point errors. These aberrations (bridges, pseudochiasmata, multipolar cells, acentric fragments, etc.) are extremely sensitive indicators of genetic damage.

The Dominant Lethal Test is an accurate and sensitive measure of the amount and type of fetal wastage which may occur following administration of a potential mutagen. Dominant lethal mutations are indicators of lethal genetic lesions. The effects of mutagens on the chromosomal complement of the spermatozoa of treated males results in alterations of form and number of chromosomes. Structural rearrangements and aneuploidy may lead to the production of non-viable zygotes, early and late fetal deaths, abortions

and congenital malformations. In addition, aberrations could lead to sterility or reduced reproductive capacity of the F_1 generation. The action of a mutagen on specific portions of spermatogenesis is also apparent in this test.

B. Objective

The purpose of these studies is to determine any mutagenic effect of the test compound by employing the Host Mediated Assay, Cytogenetics Studies and the Dominant Lethal Assay, both in vivo and in vitro tests are employed with the cytogenetic and microbial test systems. These tests and their descriptions are referenced in the Appendices A through F.

C. Compound

1. Test Material

Compound FDA 71-40, Dilauryl thiodipropionic acid 10-769, as supplied by the Food and Drug Administration.

2. Dosages

The animals employed, the determination of the dosage levels and the route of administration are contained in the technical discussions.

The dosage levels employed for compound FDA 71-40 are as follows for Cytogenetics Studies in vivo in rats.

Low Level	50	mg/kg
Intermediate Level	500	mg/kg
LD ₅	5000	mg/kg
Negative Control	saline	
Positive Control (TEM*)	0.3	mg/kg

The dosage levels employed for compound FDA 71-40 are as follows for Host Mediated Assay in vivo in mice.

Low Level	50	mg/kg
Intermediate Level	500	mg/kg
LD ₅	5000	mg/kg
Negative Control	saline	
Positive Control (EMS **)	350	mg/kg
(DMN***)	100	mg/kg

- * Triethylene Melamine
- ** Ethyl Methane Sulfonate
- *** Dimethyl Nitrosamine



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The dosage levels employed for compound FDA 71-40 are as follows for the Dominant Lethal Assay in vivo in rats.

Low Level	50	mg/kg
Intermediate Level	500	mg/kg
LD ₅	5000	mg/kg
Negative Control	saline	
Positive Control (TEM*)	0.3	mg/kg

The in vitro cytogenetics studies were performed employing three logarithmic dose levels.

Low Level	5.0	mcg/ml
Medium Level	50.0	mcg/ml
High Level	500.0	mcg/ml
Negative Control	saline	
Positive Control (TEM*)	0.1	mcg/ml

The discussion of this test is contained in the technical discussions.

D. Methods

The protocols employed are explained in Appendices C and D.

E. Summary

1. Host Mediated Assay

Compound FDA 71-40 produced no significant reversion or recombinant increases in Salmonella strain TA-1530 or Saccharomyces strain D-3 respectively.

The results from tests using Salmonella strain G-46 indicated that this compound induced reversion in both the acute and subacute trials. A slight dose response was observed in the acute trials but not in the subacute trials.

Repeat tests of the subacute trials indicated the compound induced reversion, although the results were dose independent.

All in vitro tests were negative.

2. Cytogenetics

(a) In vivo - The compound produced no detectable significant aberration of the bone marrow metaphase chromosomes of rats when administered orally at the dosage levels employed in this study.

(b) In vitro - The compound produced no significant aberration in the anaphase chromosomes of human tissue culture cells when tested at the dosage levels employed in this study.

3. This compound was considered to be non-mutagenic in rats in the dominant lethal assay when using the dosages employed in this study.

F-RESULTS AND DISCUSSION

1. TOXICITY

a. In vivo

Two male rats with an average body weight of 370 grams were given compound FDA 71-40 on an acute basis of 5000 mg/kg of body weight. The compound was in a suspension of 0.85% sterile saline and was administered by gastric intubation. All animals appeared normal during treatment and for an additional five days post-treatment observation. Necropsies of these animals on day six revealed no gross morphological change in the organs examined. The work was repeated with a group of ten male albino rats with an average body weight of 383 grams with the same findings. In the experiment 5000 mg/kg was administered at the high level, 500 mg/kg at the intermediate level, and 50 mg/kg at the low level. These dosages were employed in both the acute and the subacute in vivo studies. Animals in the acute studies were given a single dose of the compound. The subacute study animals were given the same dosages as those in the acute study, each day for five consecutive days 24 hours apart.

b. In vitro

The compound was suspended in 0.85% saline at the concentrations listed. It was introduced into culture tubes containing WI-38 cells in a logarithmic phase of growth. The cells were observed for cytopathic effect (CPE) and the presence of mitoses at 24 and 48 hours.



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<u>Tube No.</u>	<u>No. of cells</u>	<u>Conc. mcg/ml</u>	<u>CPE</u>	<u>Mitosis</u>
1	5x10 ⁵	1000	+	+
2	"	1000	+	+
3	"	500	-	+
4	"	500	-	+
5	"	100	-	+
6	"	100	-	+
7	"	50	-	+
8	"	50	-	+
9	"	10	-	+
10	"	10	-	+

Since a CPE was observed at 1000 mcg/ml a closer range of concentrations was employed, as follows.

1	1x10 ⁵	1000	+	+
2	"	1000	-	+
3	"	750	+	+
4	"	750	-	+
5	"	500	-	+
6	"	500	-	+
7	"	250	-	+
8	"	250	-	+
9	"	125	-	+
10	"	125	-	+

The high level used was 500 mcg/ml. The intermediate level used was 50 mcg/ml and the low level 5 mcg/ml.



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c. TOXICITY DATA

COMPOUND FDA 71-40

This compound was administered at an extremely high concentration of 5000 mg/kg with no abnormal effect observed in the animals.

Solvent: 0.85% sterile saline

Animals: Two (2) male rats--average weight 370 grams (observation period six [6] days).

Ten (10) rats--average weight 383 grams (observation period five [5] days).

Range finding:

<u>Dose</u>	<u>No. Dead/No. Animals</u>	<u>Necropsy and Day of Death</u>
5000 mg/kg	0/2	None
5000 mg/kg	0/10	None

There were no abnormal gross pathology findings in the animals dosed at 5000 mg/kg and a determination of an LD₅₀ was not performed.

2. Host Mediated Assay

Compound FDA 71-40 produced no significant reversion or recombinant increases in Salmonella strain TA-1530 or Saccharomyces strain D-3 respectively.

The results from tests using Salmonella strain G-46 indicated that this compound induced reversion in both the acute and subacute trials. A slight dose response was observed in the acute trials but not in the subacute trials.

Repeat tests of the subacute trials indicated the compound induced reversion, although the results were dose independent.

All in vitro tests were negative.



EVALUATION SHEET

Compound: 71-40 Dilauryl Thiodipropionic Acid

Indicator Strain	In Vitro	In Vivo		
		Possible Low Recoveries	Controls	Other Comments
TA-1530	pos.	NC	NC OK	1. The recoveries of some of the subacute trials were low and slightly elevated the reversion freq. The results are still in line and should be acceptable
11/3/72 NC + Acutes	(neg.)	PC	PC OK	
		AL		
		AI		
		AH	SANC OK	
11/1/72 PC, NC Subacutes		SANC		
		SAL		
		SAI		
		SAH		

G-46	pos.	NC	NC OK	1. Acute doses are positive and show a dose response. 2. Subacute doses are positive. No dose response.
5/19/72	(neg.)	PC	PC A little low	
		AL		
		AI		
		AH	SANC OK	
		SANC		
		SAL		
		SAI		
		SAH		

D3	pos.	NC	NC OK	1. No problems
5/1/72 PC, NC Acutes	(neg.)	PC	PC OK	
		AL		
		AI		
		AH	SANC OK	
5/5/72 Subacutes		SANC		
		SAL		
		SAI		
		SAH		

Summary: These mice were tested under the same positive control as compound 36 and my comments regarding the lower than expected positive control results apply to this compound. All of the other data should be acceptable. The fact that some of the subacute recoveries for TA-1530 were a little low was not reflected in the reversion frequencies which were well in line with what would be expected. G-46 results indicate mutagenicity IN VIVO by this compound. TA-1530 and D3 were negative.

David Brunk

EVALUATION SHEET

Compound: FDA-71-40

(Repeat)

Indicator Strain	In Vitro	In Vivo		
		Possible Low Recoveries	Controls	Other Comments
TA-1530	pos.	NC	NC	
		PC		
	neg.	AL	PC	
		AI		
Not repeated		AH	SANC	
		SANC		
		SAL		
		SAI		
		SAH		

G-46				
Subacutes only	pos.	NC	NC OK	1. All three dose levels appear positive and show a slight dose response.
		PC		
	neg.	AL	PC OK	
		AI		
		AH	SANC OK	
		SANC		
		SAL		
		SAI		
		SAH		

D3				
	pos.	NC	NC	
		PC		
	neg.	AL	PC	
		AI		
Not repeated		AH	SANC	
		SANC		
		SAL		
		SAI		
		SAH		

Summary: Compound 40 shows mutagenic activity in G-46 at the subacute level when compared to the positive and negative controls. A slight dose response is seen, although it is probably not significant. I feel that these results should be accepted.

David Brink

HOST MEDIATED ASSAY
SUMMARY SHEETS

CONTRACT FDA 71-268
COMPOUND FDA 71-40
DILAURL THIODIPROPIONIC ACID



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HOST MEDIATED ASSAY

SUMMARY SHEET

OUTLIERS REMOVED

COMPOUND: FDA 71-40

	SALMONELLA				SACCHAROMYCES D-3	
	TA1538	G-46				
	MMF (X 10E-8)	MFT/MFC	MMF (X 10E-8)	MFT/MFC	MRF (X 10E-5)	MRT/MRC
ACUTE						
NC	.58		.45		4.80	
PC	8.00	13.79	9.51	21.13	55.17	11.70
AL	1.84	2.66	2.11	4.69	5.02	1.05
AI	.41	.71	4.01	10.02	8.19	1.71
AD	1.45	2.50	5.36	11.91	6.86	1.43
SUBACUTE						
NC	.66		.45		4.93	
PC	1.96	2.97	5.79	12.37	4.66	.94
AL	1.22	1.85	6.62	15.16	4.27	.67
AD	2.35	3.56	5.99	13.31	4.47	.91

IN VITRO	TA1538	G-46	% CONC	D-3 % SURVIVAL	R X 10E5
----------	--------	------	--------	-------------------	----------

NC
PC

STOP

HOST MEDIATED ASSAY

SUMMARY SHEET

OUTLIERS INCLUDED

COMPOUND: FDA 71-40

	SALMONELLA		SACCHAROMYCES D-3	
	TA1538	G-46		
	MME (X 10E-3)	MFT/MFC	MME (X 10E-3)	MFT/MFC
ACUTE				
NC	.58		.54	
PC	6.80	13.79	9.51	17.61
A	1.58	2.66	2.11	3.31
AD	.81	.71	4.51	6.33
AD	1.71	2.55	5.35	9.55
SEMI ACUTE				
NC	.25		.54	
SC	2.55	2.83	5.02	10.04
SA	1.98	2.27	6.82	12.13
SA	2.35	2.83	5.99	11.09
IN VITRO	TA1538	G-46	D-3	
			% CONC	% SURVIVAL
TCPD	-	-	10.0	81.2
NC	-	-	-	100.0
PC	+	+	1.0	42.7
				R X 10E5
				11
				5
				381

STOP

HOST MEDIATED ASSAY (REPEAT)

SUMMARY SHEET

OUTLIERS REMOVED

COMPOUND: FDA 71-40

	SALMONELLA				SACCHAROMYCES D-3	
	TA1530		G-46			
	MMF (X 10E-8)	MFT/MFC	MMF (X 10E-8)	MFT/MFC	MRF (X 10E-5)	MRT/MRC
ACUTE						
NC	1.00		.62		1.00	
PC	0.	0.	16.46	26.55	0.	0.
AL	0.	0.	0.	0.	0.	0.
AI	0.	0.	0.	0.	0.	0.
AH	0.	0.	0.	0.	0.	0.
SUBACUTE						
NC	1.00		.62		1.00	
SL	0.	0.	5.62	9.06	0.	0.
SI	0.	0.	6.36	10.26	0.	0.
SH	0.	0.	6.08	9.81	0.	0.

IN VITRO	TA1530	G-46		D-3	
			% CONC	% SURVIVAL	R X 10E5
NC					
PC					

STOP
SRU'S:.6
!SWITCH IN\$:MC606
!DIV

HOST MEDIATED ASSAY (REPEAT)

SUMMARY SHEET

OUTLIERS INCLUDED

COMPOUND: FDA 71-40

	SALMONELLA				SACCHAROMYCES D-3	
	TA1530	G-46	TA1530	G-46	TA1530	G-46
	MMF (X 10E-8)	MFT/MFC	MMF (X 10E-8)	MFT/MFC	MMF (X 10E-8)	MFT/MFC
ACUTE						
NC	1.00		.62		1.00	
PC	0.	0.	16.46	26.55	0.	0.
AL	0.	0.	0.	0.	0.	0.
AI	0.	0.	0.	0.	0.	0.
AH	0.	0.	0.	0.	0.	0.
SUBACUTE						
NC	1.00		.62		1.00	
SL	0.	0.	5.62	9.06	0.	0.
SI	0.	0.	6.03	9.73	0.	0.
SH	0.	0.	6.33	10.21	0.	0.

IN VITRO	TA1530	G-46	D-3
	% CONC	% SURVIVAL	R X 10E5

NC
PC

STOP
SRU'S:.5
!OFF

USAGE ON 07/30/73 AT 10:25:23
SRU'S:3.8 ELAPSED TIME: 00:10:48

9
GOOD BYE.

HOST MEDIATED ASSAY

DATA SHEETS

CONTRACT FDA 71-268

COMPOUND FDA 71-40

Dilauryl Thiodipropionic Acid

Host Mediated Assay - Adjusted Raw CFU x $10^7/0.6$ ml

The true raw colony counts were lost through automation for this compound. Thus, the source of the adjusted raw CFU x $10^7/0.6$ ml (Column A) was the true raw counts as assimilated by the automatic colony counter, multiplied by the automatic program by 0.1666666666667 (Column B) and then divided by 0.1667 (the check figure). The original concept was that the true CFU x $10^7/0.6$ ml would be printed as column A. Through a programming anomaly the Column B check figure was obtained as the raw CFU x $10^7/0.6$ ml and recorded as such.

- Step 1: Technician set counter - plates on counter.
- Step 2: Automatic equipment accumulates counts on 3 plates of 10^{-6} dilution as CFU x $10^7/0.6$ ml.
- Step 3: Automatic equipment multiplies count obtained in step 1 by 0.1666666666667 to obtain total count/ml at 10^8 .
- Step 4: Automatic check of result of step 3.
 $TC \times 10^8 \div 0.1667 = CFU \times 10^7/0.6$ ml
- Step 5: Technician was to record the true raw CFU x $10^7/0.6$ ml in log book, however, through error the computer provided the Column B check figure as the raw count.

To clarify the problem Column A is headed Adjusted Raw CFU X $10E^7/0.6$ ml in each case where the check figure was provided as the raw count.



HOST MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA TA1538

DOSE LEVEL: NEGATIVE CONTROL - SALINE

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: NOVEMBER 3, 1972

ANIMAL NUMBER	A RAW CFU X 10E7/0.5ML	B TOTAL CFU X 10E3/1.0ML	C TOTAL NO. MUTANTS X 10E0/1.0ML	D MUTATION FRE (C/B) X 10E-5
1	31.70	5.23	3.00	.57
2	35.20	5.67	2.00	.34
3	21.70	3.82	2.00	.55
4	47.00	7.83	1.00	.13
5	27.10	4.92	4.00	.89
6	17.60	2.93	3.00	1.02
7	22.50	3.75	2.00	.53
8	34.00	5.67	3.00	.53
9	43.50	7.83	5.00	.68

NO. OF ANIMALS EQUALS 9
SAMPLES WITH ZERO MUTANTS EQUAL 1

	COL. B (X 10E3)	COL. C (X 10E0)	COL. D (X 10E-5)
MEAN	5.20	2.70	.59
RANGE	4.90	4.00	.90
MAX	7.83	5.00	1.02
MIN	2.93	1.00	.13

NO OUTLIERS

HOST-MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA TA1538

DOSE LEVEL: POSITIVE CONTROL - DMS - 100 MG/KG

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: NOVEMBER 1, 1972

ANIMAL NUMBER	A RAW CFU X 10E7/0.0ML	B TOTAL CFU X 10E6/1.0ML	C TOTAL NO. MUTANTS X 10E0/1.0ML	D MUTATION FRE (C/B) X 10E-3
1	35.20	5.87	38.00	6.49
2	22.30	3.88	42.00	11.05
3	31.70	5.26	25.00	5.39
4	19.20	3.20	30.00	9.37
5	28.40	4.75	22.00	4.65
6	31.00	5.17	35.00	6.97
7	23.10	3.85	47.00	12.21

NO. OF ANIMALS EQUALS 7

NO. OF CONTAMINATED EQUALS 1

TOTAL CFU OUT OF RANGE EQUALS 2

	COL. B (X 10E6)	COL. C (X 10E0)	COL. D (X 10E-3)
MEAN	4.56	34.71	8.80
RANGE	2.07	25.00	7.56
MAX	5.87	47.00	12.21
MIN	3.20	22.00	4.65

NO OUTLIERS

11/01/72 02 DEC 72 15:18:51 USER CFU007 200

55 IN 482 OUT 0 LINES 521 PROCESSING TIME 19.60 SECONDS

HOST-MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA TA1538

DOSE LEVEL: LOW - 50 MG/KG

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: NOVEMBER 3, 1972

ANIMAL NUMBER	A RAW CFU X 10 ⁸ /0.5ML	B TOTAL CFU X 10 ⁸ /1.0ML	C TOTAL NO. MUTANTS X 10 ⁸ /1.0ML	D MUTATION FRE (C/B) X 10 ⁻⁹
1	25.50	4.25	4.00	.94
2	35.40	6.07	5.00	.99
3	11.00	1.93	2.00	1.03
4	73.40	12.23	3.00	.25
5	16.70	2.70	7.00	2.51
6	6.40	1.40	5.00	3.57
7	16.20	2.70	5.00	1.85
8	20.50	3.47	4.00	1.15

NO. OF ANIMALS EQUALS 8
TOTAL CFU OUT OF RANGE EQUALS 2

	COL. B (X 10 ⁸)	COL. C (X 10 ⁸)	COL. D (X 10 ⁻⁹)
MEAN	4.25	4.50	1.59
RANGE	10.13	5.00	3.33
MAX	12.23	7.00	3.57
MIN	1.40	2.00	.25

NO OUTLIERS

HOST-MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA TA1538

DOSE LEVEL: INTERMEDIATE - 500 MG/KG

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: NOVEMBER 3, 1972

ANIMAL NUMBER	A RAW CFU X 10E7/0.6ML	B TOTAL CFU X 10E6/1.0ML	C TOTAL NO. MUTANTS X 10E6/1.0ML	D MUTATION FRE (C/D) X 10E-6
1	36.30	6.00	3.00	.60
2	21.10	3.52	3.00	.85
3	45.00	7.50	2.00	.27
4	20.30	3.30	1.00	.30
5	35.00	5.97	1.00	.17
6	60.80	10.13	2.00	.20
7	37.00	6.17	4.00	.65
8	38.10	6.30	2.00	.31
9	39.40	6.57	3.00	.46

NO. OF ANIMALS EQUALS 9

TOTAL CFU OUT OF RANGE EQUALS 1

	COL. B (X 10E8)	COL. C (X 10E6)	COL. D (X 10E-6)
MEAN	6.18	2.33	.71
RANGE	6.75	3.00	.69
MAX	10.13	4.00	.65
MIN	3.38	1.00	.17

NO OUTLIERS

HOST-MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA TA1538

DOSE LEVEL: HIGH - 5000 MG/KG

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: NOVEMBER 3, 1972

ANIMAL NUMBER	A RAW CFU X 10E7/0.6ML	B TOTAL CFU X 10E8/1.0ML	C TOTAL NO. MUTANTS X 10E8/1.0ML	D MUTATION FRE (C/D) X 10E-8
1	18.10	3.05	4.00	1.33
2	12.40	2.07	5.00	2.42
3	6.30	1.05	4.00	3.81
4	10.10	1.05	2.00	1.10
5	13.30	2.22	2.00	.99
6	7.00	1.17	1.00	.85
7	42.20	7.03	5.00	.55
8	9.70	1.62	5.00	1.86
9	21.80	3.05	6.00	2.20

NO. OF ANIMALS EQUALS 9
TOTAL CFU OUT OF RANGE EQUALS 1

	COL. B (X 10E8)	COL. C (X 10E8)	COL. D (X 10E-8)
MEAN	2.51	3.89	1.71
RANGE	5.93	7.00	2.96
MAX	7.03	8.00	3.81
MIN	1.05	1.00	.85

* SUMMARY WITH OUTLIERS REMOVED

	COL. B (X 10E8)	COL. C (X 10E8)	COL. D (X 10E-8)
MEAN	2.00	3.33	1.65
RANGE	5.87	7.00	1.57
MAX	7.03	8.00	2.42
MIN	1.17	1.00	.85

HOST-MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA TA1538

DOSE LEVEL: NEGATIVE CONTROL - SUBACUTE TRIALS

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: NOVEMBER 1, 1977

ANIMAL NUMBER	A RAW CFU X 10E7/0.0ML	B TOTAL CFU X 10E8/1.0ML	C TOTAL NO. MUTANTS X 10E0/1.0ML	D MUTATION FRE (C/B) X 10E-8	
1	8.70	1.45	3.00	2.07	*
2	16.40	2.75	2.00	.73	
3	17.80	2.97	1.00	.34	
4	15.80	2.33	1.00	.36	
5	12.00	2.13	1.00	.47	
6	13.40	2.25	2.00	.90	
7	16.20	2.70	2.00	.74	
8	22.70	3.78	4.00	1.06	

NO. OF ANIMALS EQUALS 8
TOTAL CFU OUT OF RANGE EQUALS 1
SAMPLES WITH ZERO MUTANTS EQUAL 1

	COL. B (X 10E8)	COL. C (X 10E0)	COL. D (X 10E-8)
MEAN	2.80	2.00	.83
RANGE	2.33	3.00	1.73
MAX	3.78	4.00	2.07
MIN	1.45	1.00	.34

* SUMMARY WITH OUTLIERS REMOVED

	COL. B (X 10E8)	COL. C (X 10E0)	COL. D (X 10E-8)
MEAN	2.76	1.83	.66
RANGE	1.65	3.00	.72
MAX	3.78	4.00	1.06
MIN	2.13	1.00	.4

HOST MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA TA1538

DOSE LEVEL: LOW - 50 MG/KG

TREATMENT: IN VIVO, ORAL, SUBACUTE

DATE STARTED: NOVEMBER 1, 1972

ANIMAL NUMBER	A RAW CFU X 10E7/0.6ML	B TOTAL CFU X 10E8/1.0ML	C TOTAL NO. MUTANTS X 10E0/1.0ML	D MUTATION FRE. (C/B) X 10E-8
1	29.40	4.90	8.00	1.63
2	3.30	1.38	7.00	5.06 *
3	21.60	3.60	8.00	2.22
4	22.00	3.67	6.00	1.64
5	16.90	2.82	3.00	1.07
6	13.40	2.23	7.00	3.13
7	10.30	1.72	6.00	3.50
8	10.70	1.73	1.00	.56

NO. OF ANIMALS EQUALS 8

NO. OF CONTAMINATED EQUALS 2

	COL. B (X 10E8)	COL. C (X 10E0)	COL. D (X 10E-8)
MEAN	2.76	5.75	2.35
RANGE	3.62	7.00	4.50
MAX	4.90	8.00	5.06
MIN	1.38	1.00	.56

* SUMMARY WITH OUTLIERS REMOVED

	COL. B (X 10E8)	COL. C (X 10E0)	COL. D (X 10E-8)
MEAN	2.96	5.57	1.96
RANGE	3.16	7.00	2.93
MAX	4.90	8.00	3.50
MIN	1.72	1.00	.56

HOST MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA TA1538

DOSE LEVEL: INTERMEDIATE - 500 MG/KG

TREATMENT: IN VIVO, ORAL, SUBACUTE

DATE STARTED: NOVEMBER 1, 1972

ANIMAL NUMBER	A RAW CFU X 10E7/0.6ML	B TOTAL CFU X 10E8/1.0ML	C TOTAL NO. MUTANTS X 10E0/1.0ML	D MUTATION FRE (C/B) X 10E-8	
1	17.20	2.87	2.00	.70	
2	8.70	1.45	5.00	3.43	
3	31.90	5.32	4.00	.75	
4	56.10	9.35	13.00	1.39	
5	11.10	1.85	12.00	6.49	*
6	17.00	2.33	4.00	1.41	
7	16.00	2.00	1.00	.36	
8	23.30	3.83	2.00	.52	

NO. OF ANIMALS EQUALS 8
 NO. OF CONTAMINATED EQUALS 1
 SAMPLES WITH ZERO MUTANTS EQUAL 1

	COL. B (X 10E8)	COL. C (X 10E0)	COL. D (X 10E-8)
MEAN	3.79	5.33	1.65
RANGE	7.90	12.00	6.13
MAX	9.35	13.00	6.49
MIN	1.45	1.00	.36

* SUMMARY WITH OUTLIERS REMOVED

	COL. B (X 10E8)	COL. C (X 10E0)	COL. D (X 10E-8)
MEAN	4.07	4.43	1.22
RANGE	7.90	12.00	3.09
MAX	9.35	13.00	3.45
MIN	1.45	1.00	.36

HOST MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA TA1538

DOSE LEVEL: HIGH - 5000 MG/KG

TREATMENT: IN VIVO, ORAL, SUBACUTE

DATE STARTED: NOVEMBER 1, 1972

ANIMAL NUMBER	A RAW CFU X 10E7/0.6ML	B TOTAL CFU X 10E8/1.0ML	C TOTAL NO. MUTANTS X 10E0/1.0ML	D MUTATION FRE. (C/B) X 10E-8
1	40.20	6.70	9.00	1.34
2	44.60	7.43	11.00	1.48
3	10.40	1.73	1.00	.58
4	47.10	7.85	5.00	.64
5	42.80	7.13	6.00	.84
6	18.00	3.00	19.00	6.33
7	41.10	6.85	16.00	2.34
8	17.10	2.85	15.00	5.26

NO. OF ANIMALS EQUALS 8
NO. OF CONTAMINATED EQUALS 1
SAMPLES WITH ZERO MUTANTS EQUAL 1

	COL. B (X 10E8)	COL. C (X 10E0)	COL. D (X 10E-8)
MEAN	5.44	10.25	2.65
RANGE	6.12	16.00	5.73
MAX	7.85	19.00	6.33
MIN	1.73	1.00	.58

NO OUTLIERS

CCX CSC85F 02 DEC 72 15:25:45 USER CFU007 200
CARDS IN 314 OUT 0 LINES 229 PROCESSING TIME 11.46 SECONDS

HOST-MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA 0-46

DOSE LEVEL: NEGATIVE CONTROL - SALINE

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: MAY 19, 1972

ANIMAL NUMBER	A ADJUSTED RAW CFU X 10E7/0.6ML	B TOTAL CFU X 10E2/1.0ML	C TOTAL NO. MUTANTS X 10E0/1.0ML	D MUTATION FRL (C/B) X 10E-3
1	27.26	4.71	1.00	.21
2	54.96	9.16	4.00	.44
3	27.90	4.93	1.00	.23
4	43.14	6.59	5.00	.75
5	34.06	5.63	7.00	1.23 *
6	37.36	6.26	4.00	.64
7	26.22	3.37	1.00	.30
8	31.44	5.24	4.00	.76
9	69.72	10.12	3.00	.30

NO. OF ANIMALS EQUALS 9

TOTAL CFU OUT OF RANGE EQUALS 1

	COL. B (X 10E2)	COL. C (X 10E0)	COL. D (X 10E-3)
MEAN	6.14	3.33	.54
RANGE	6.75	6.00	1.02
MAX	10.12	7.00	1.23
MIN	3.37	1.00	.21

* SUMMARY WITH OUTLIERS REMOVED

	COL. B (X 10E2)	COL. C (X 10E0)	COL. D (X 10E-3)
MEAN	6.20	3.00	.45
RANGE	6.75	6.00	.56
MAX	10.12	6.00	.76
MIN	3.37	1.00	.21

HOST MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA G-46

DOSE LEVEL: POSITIVE CONTROL - DMN - 100 MG/KG

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: MAY 19, 1972

ANIMAL NUMBER	A ADJUSTED RAW CFU X 10E7/0.6ML	B TOTAL CFU X 10E6/1.0ML	C TOTAL NO. MUTANTS X 10E0/1.0ML	D MUTATION FRE (C/D) X 10E-8
1	11.82	1.97	20.00	10.15
2	29.08	4.93	34.00	6.83
3	23.94	3.99	38.00	9.52
4	22.89	3.78	24.00	6.35
5	33.78	5.83	44.00	7.82
6	33.90	5.65	75.00	13.27
7	20.13	3.36	23.00	6.86
8	39.20	6.53	97.00	14.85
9	37.70	6.23	61.00	9.71
10	32.55	5.43	55.00	9.77

NO. OF ANIMALS EQUALS 10

	COL. B (X 10E6)	COL. C (X 10E0)	COL. D (X 10E-8)
MEAN	4.76	46.90	9.51
RANGE	4.56	77.00	8.00
MAX	6.53	97.00	14.85
MIN	1.97	20.00	6.35

NO OUTLIERS

HOST-MEDIATED ASSAY REPORT SHEET

CONTAINER ID: 71-00

ORGANISM: SALMONELLA G-03

DOSE LEVEL: L₅₀ = 50 PC/80

TREATMENT: G. VIVO, ORAL, ACUTE

DATE STARTED: MAY 19, 1972

	A ADJUSTED RAW CPM X 10E7/0.05 L	B TOTAL CPM X 10E8/1.0ML	C TOTAL NO. MUTANTS X 10E6/1.0ML	D MUTATION FRE. (C/A) X 10E-6
1	25.32	0.11	40.00	0.00
2	17.10	2.11	4.00	1.00
3	22.10	3.70	5.00	1.00
4	35.18	5.90	5.00	.00
5	35.10	5.70	2.00	.00
6	36.00	6.01	5.00	1.00
7	34.13	5.70	5.00	1.00
8	13.74	2.01	1.00	2.00
9	53.08	6.00	45.00	5.00

NO. OF TUBES TOTALS 9

TOTAL CPM OUT OF 9 TUBES 400.00

	COL. B (X 10 ⁻⁶)	COL. C (X 10E6)	COL. D (X 10E-6)
RAW	1.9	11.55	2.11
ADJ.	6.70	43.00	4.07
PA	0.00	40.00	0.00
TD	0.00	2.00	.00
TOTALS			

HOST-MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA G-40

DOSE LEVEL: INTERMEDIATE - 500 MG/KG

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: MAY 19, 1972

ANIMAL NUMBER	A ADJUSTED RAW CFU X 1007/1.0ML	B TOTAL CFU X 1008/1.0ML	C TOTAL NO. MUTANTS X 1000/1.0ML	D MUTATION FRE (C/F) X 10E-7
1	27.84	4.84	15.00	2.86
2	20.64	3.44	9.00	2.62
3	27.86	4.81	23.00	6.21
4	25.78	4.16	25.00	5.96
5	24.86	4.11	15.00	3.39
6	32.88	5.46	35.00	7.66
7	25.26	4.21	15.00	3.00

NO. OF ANIMALS, EQUALS 7

NO. OF DEAD ANIMALS EQUALS 1

TOTAL CFU OUT OF RANGE EQUALS 2

	COL. B (X 10E8)	COL. C (X 10E6)	COL. D (X 10E-8)
MEAN	4.86	20.29	4.51
RANGE	1.49	29.00	4.29
MAX	5.46	35.00	7.66
MIN	3.44	9.00	2.62
NO OUTLIERS			

TEST REPORTED AS BY REPORT 5-22-71

EXPERIMENT: FDA 71-40

ORGANISM: SALMONELLA G-60

DISEASE LEVEL: HIGH - 5000 NO/KG

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: MAY 19, 1971

	A	B	C	D
	ADJUSTED		TOTAL NO.	QUANTIFICATION
INITIAL	RAW C.F.U. X	TOTAL C.F.U. X	NO. OF TS X	PRE (C/P)
NUMBER	10 ² /0.04g	10 ² /0.04g	10 ² /1.0g	X 10 ⁵ -1
1	15.30	2.50	24.00	9.57
2	11.10	1.10	8.00	4.34
3	15.14	3.27	6.00	2.51
4	15.10	2.30	7.00	2.77
5	15.14	2.75	8.00	1.75
6	15.10	3.10	17.00	5.41
7	31.00	5.21	21.00	5.37
8	14.14	2.14	11.00	6.21
9	15.26	1.71	17.00	9.54

NO. OF POSITIVE TUBES: 9
TOTAL C.F.U. OUT OF 9 TUBES: 1

	COL. B	COL. C	COL. D
	(X 10 ⁵)	(X 10 ⁵)	(X 10 ⁵ -2)
MEAN	2.80	14.30	5.76
RANGE	3.20	24.00	8.00
MAX	5.21	28.00	9.54
MIN	1.71	4.00	1.75

NO OUTLIERS

HOST MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA G-45

DOSE LEVEL: LOW - 50 MG/KG

TREATMENT: IN VIVO, ORAL, SUBCUT

DATE STARTED: MAY 19, 1972

A ANIMAL NUMBER	B ADJUSTED RAW CFU X 10E7/0.6ML	C TOTAL CFU X 10E8/1.0ML	D TOTAL NO. MUTANTS X 10E6/1.0ML	E MUTATION FRE (C/R) X 10E-3
1	37.62	6.27	26.00	4.47
2	33.34	5.64	25.00	4.43
3	35.32	5.67	35.00	5.86
4	31.06	5.35	35.00	6.57
5	33.38	6.46	29.00	4.43
6	37.14	6.12	13.00	2.10
7	43.14	7.19	51.00	8.88
8	42.42	7.07	54.00	7.68
9	34.74	5.79	26.00	4.49
10	25.36	4.26	24.00	5.63

NO. OF ANIMALS EQUALS 10

	COL. B (X 10E6)	COL. C (X 10E6)	COL. D (X 10E-3)
MEAN	6.61	33.00	5.62
RANGE	2.93	43.00	6.56
MAX	7.19	51.00	8.88
MIN	4.26	13.00	2.10

* SUMMARY WITH OUTLIERS REMOVED

	COL. B (X 10E6)	COL. C (X 10E6)	COL. D (X 10E-3)
MEAN	5.99	35.22	5.79
RANGE	2.93	37.00	6.25
MAX	7.19	51.00	8.88
MIN	4.26	24.00	4.43

IMMEDIATE ASAY REPORT SHEET

CO. POOR: 100-71-10

ORGANISM: SALMONELLA D-45

DOSE LEVEL: INTERMEDIATE - 500 MG/KG

TREATMENT: IN VIVO, ORAL, SUBCUT.

DATE STARTED: MAY 19, 1971

ANIMAL NUMBER	A ADJUSTED RAW CFU X 1007/0.0ML	B TOTAL CFU X 1000/1.0ML	C TOTAL NO. MUTANTS X 1000/1.0ML	D MUTATION FRE (C/B) X 10 ⁴ -
1	35.30	8.65	30.00	4.96
2	29.72	4.67	42.00	8.62
3	21.15	3.55	35.00	9.91
4	22.65	4.25	34.00	7.94
5	32.38	5.46	33.00	6.04
6	25.56	4.25	25.00	6.51
7	30.18	6.05	35.00	5.82
8	26.96	4.65	25.00	6.00
9	33.36	5.66	22.00	4.35

NO. OF ANIMALS EQUALS 9
NO. OF DEAD ANIMALS EQUALS 1

	COL. B (X 1000)	COL. C (X 1000)	COL. D (X 10 ⁴ -8)
MEAN	4.53	32.67	6.52
RANGE	2.52	20.00	9.91
MAX	6.05	42.00	9.91
MIN	3.53	22.00	4.35

NO OUTLIERS

HIST MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA 6-46

DOSE LEVEL: HIGH - 5000 MG/KG

TREATMENT: IN VIVO, ORAL, SUBCUT

DATE STARTED: MAY 19, 1972

ANIMAL NUMBER	A ADJUSTED RAW CFC X 10 ⁷ /1.0ML	B TOTAL CFC X 10 ⁸ /1.0ML	C TOTAL NO. MUTANTS X 10 ⁶ /1.0ML	D MUTATION FRE (C/B) X 10 ⁻⁸
1	43.32	7.22	21.00	2.91
2	23.70	3.95	26.00	6.30
3	29.34	4.59	36.00	7.36
4	26.52	4.42	32.00	7.24
5	35.78	6.13	32.00	5.22
6	26.26	4.32	25.00	6.30
7	34.32	5.72	21.00	3.67
8	27.78	4.63	24.00	5.13
9	24.48	4.86	35.00	9.31

NO. OF ANIMALS EXAMINED

NO. OF DEAD ANIMALS EXAMINED

1

	COL. B (X 10 ⁸)	COL. C (X 10 ⁶)	COL. D (X 10 ⁻⁸)
MEAN	5.05	28.67	5.09
RANGE	3.67	17.00	6.31
MAX	7.22	36.00	9.31
MIN	3.95	21.00	2.91

NO OUTLIERS

HOST MEDIATED ASSAY REPORT SHEET (REPEAT)

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA G-46

DOSE LEVEL: NEGATIVE CONTROL - SALINE

TREATMENT: IN VIVO, ORAL, SUBACUTE

DATE STARTED: JULY 9, 1973

ANIMAL NUMBER	A RAW CFU X 10E7/0.6ML	B TOTAL CFU X 10E8/1.0ML	C TOTAL NO. MUTANTS X 10E0/1.0ML	D MUTATION FRE (C/B) X 10E-8
1	53.90	8.98	2.00	.22
2	54.80	9.13	5.00	.55
3	35.70	5.95	2.00	.34
4	50.30	8.38	6.00	.72
5	41.30	6.88	4.00	.58
6	44.20	7.37	6.00	.81
7	83.70	13.95	8.00	.57
8	61.90	10.32	7.00	.68
9	52.10	8.68	7.00	.81
10	96.30	16.05	15.00	.93

NO. OF ANIMALS EQUALS 10

	COL. B (X 10E8)	COL. C (X 10E0)	COL. D (X 10E-8)
MEAN	9.57	6.20	.62
RANGE	10.10	13.00	.71
MAX	16.05	15.00	.93
MIN	5.95	2.00	.22

NO OUTLIERS

STOP
SRU'S:.6
!SWITCH IN\$:MC662
!SAL

HOST MEDIATED ASSAY REPORT SHEET (REPEAT)

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA G-46

DOSE LEVEL: POSITIVE CONTROL - DMN - 100 MG/KG

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: JULY 9, 1973

	A	B	C	D
ANIMAL NUMBER	RAW CFU X 10E7/0.6ML	TOTAL CFU X 10E8/1.0ML	TOTAL NO. MUTANTS X 10E0/1.0ML	MUTATION FRE (C/B) X 10E-8
1	84.50	14.08	182.00	12.92
2	58.00	9.67	176.00	18.21
3	89.00	14.83	187.00	12.61
4	39.30	6.55	143.00	21.83
5	56.10	9.35	153.00	16.36
6	35.90	5.98	132.00	22.06
7	63.00	10.50	199.00	18.95
8	76.70	12.78	173.00	13.53
9	72.20	12.03	141.00	11.72
10	65.20	10.87	178.00	16.38

NO. OF ANIMALS EQUALS 10

	COL. B (X 10E8)	COL. C (X 10E0)	COL. D (X 10E-8)
MEAN	10.67	166.40	16.46
RANGE	8.85	67.00	10.34
MAX	14.83	199.00	22.06
MIN	5.98	132.00	11.72

NO OUTLIERS

STOP

SRU'S:.6

!SWITCH IN\$:MC663

!SAL

HOST MEDIATED ASSAY REPORT SHEET (REPEAT)

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA G-46

DOSE LEVEL: LOW - 50 MG/KG

TREATMENT: IN VIVO, ORAL, SUBACUTE

DATE STARTED: JULY 9, 1973

	A	B	C	D
ANIMAL NUMBER	RAW CFU X 10E7/0.6ML	TOTAL CFU X 10E8/1.0ML	TOTAL NO. MUTANTS X 10E0/1.0ML	MUTATION FRE (C/B) X 10E-8
1	75.10	12.52	59.00	4.71
2	31.80	5.30	38.00	7.17
3	68.80	11.47	29.00	2.53
4	82.30	13.72	71.00	5.18
5	74.90	12.48	48.00	3.85
6	69.30	11.55	73.00	6.32
7	45.60	7.60	62.00	8.16
8	58.20	9.70	68.00	7.01

NO. OF ANIMALS EQUALS 8

NO. OF CONTAMINATED EQUALS 1

TOTAL CFU OUT OF RANGE EQUALS 1

	COL. B (X 10E8)	COL. C (X 10E0)	COL. D (X 10E-8)
MEAN	10.54	56.00	5.62
RANGE	8.42	44.00	5.63
MAX	13.72	73.00	8.16
MIN	5.30	29.00	2.53

NO OUTLIERS

STOP

SRU'S:.6

!SWITCH IN\$:MC664

!SAL

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA G-46

DOSE LEVEL: INTERMEDIATE - 500 MG/KG

TREATMENT: IN VIVO, ORAL, SUBACUTE

DATE STARTED: JULY 9, 1973

ANIMAL NUMBER	A RAW CFU X 10E7/0.6ML	B TOTAL CFU X 10E8/1.0ML	C TOTAL NO. MUTANTS X 10E0/1.0ML	D MUTATION FRE (C/B) X 10E-8	
1	77.10	12.85	82.00	6.38	
2	71.80	11.97	41.00	3.43	**
3	93.10	15.52	91.00	5.86	
4	55.90	9.32	49.00	5.26	
5	73.90	12.32	73.00	5.93	
6	45.80	7.63	65.00	8.52	
7	52.30	8.72	71.00	8.15	
8	64.20	10.70	56.00	5.23	
9	68.10	11.35	63.00	5.55	

NO. OF ANIMALS EQUALS 9

NO. OF CONTAMINATED EQUALS 1

	COL. B (X 10E8)	COL. C (X 10E0)	COL. D (X 10E-8)
MEAN	11.15	65.67	6.03
RANGE	7.88	50.00	5.09
MAX	15.52	91.00	8.52
MIN	7.63	41.00	3.43

** SUMMARY WITH OUTLIERS REMOVED

	COL. B (X 10E8)	COL. C (X 10E0)	COL. D (X 10E-8)
MEAN	11.05	68.75	6.36
RANGE	7.88	42.00	3.28
MAX	15.52	91.00	8.52
MIN	7.63	49.00	5.23

STOP

SRU'S:.7

!SWITCH IN\$:MC601

!DI

HOST MEDIATED ASSAY REPORT SHEET (REPEAT)

COMPOUND: FDA 71-40

ORGANISM: SALMONELLA G-46

DOSE LEVEL: HIGH - 5000 MG/KG

TREATMENT: IN VIVO, ORAL, SUBACUTE

DATE STARTED: JULY 9, 1973

ANIMAL NUMBER	A RAW CFU X 10E7/0.6ML	B TOTAL CFU X 10E8/1.0ML	C TOTAL NO. MUTANTS X 10E0/1.0ML	D MUTATION FRE (C/B) X 10E-8
1	84.20	14.03	80.00	5.70
2	44.20	7.37	51.00	6.92
3	89.50	14.92	84.00	5.63
4	37.80	6.30	46.00	7.30
5	68.70	11.45	64.00	5.59
6	21.70	3.62	31.00	8.57
7	60.30	10.05	61.00	6.07
8	48.90	8.15	37.00	4.54
9	51.20	8.53	60.00	7.03
10	44.40	7.40	44.00	5.95

*

NO. OF ANIMALS EQUALS 10

	COL. B (X 10E8)	COL. C (X 10E0)	COL. D (X 10E-8)
MEAN	9.18	55.80	6.33
RANGE	11.30	53.00	4.03
MAX	14.92	84.00	8.57
MIN	3.62	31.00	4.54

* SUMMARY WITH OUTLIERS REMOVED

	COL. B (X 10E8)	COL. C (X 10E0)	COL. D (X 10E-8)
MEAN	9.80	58.56	6.08
RANGE	8.62	47.00	2.76
MAX	14.92	84.00	7.30
MIN	6.30	37.00	4.54

STOP
SRU:1.7
!SWITCH ILS:MC651

TERMINATE PRINT FILE
 RUN 200.CFD007.
 NUMBER= 200

PAP,5 PRINT ON SIX-PART PAPER

HOST MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SACCHAROMYCES D-3

DOSE LEVEL: NEGATIVE CONTROL - SALINE

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: MAY 1, 1972

ANIMAL NUMBER	A RAW CFU X 10E5/1.0ML	B TOTAL CFU SCREENED X 10E5/1.0ML	C TOTAL RECOMBINANTS /1.0ML	D RECOMB/CFU SCREENED X 10E-5
1	422.00	.42	3.00	7.11
2	173.00	.17	1.00	5.73
3	133.00	.13	.00	.00
4	648.00	.65	4.00	6.17
5	266.00	.27	2.00	7.52
6	109.00	.11	1.00	9.17
7	198.00	.20	.00	.00
8	571.00	.57	1.00	2.73
9	181.00	.18	.00	.00
TOTAL		2.50	12.00	

NO. OF ANIMALS EQUALS 9

NO. OF CONTAMINATED EQUALS 1

MEAN C/MEAN B = 4.80

	COL. B (X 10E5)	COL. C (X 10E0)	COL. D (X 10E-5)
MEAN	.28	1.33	4.27
RANGE	.54	4.00	9.17
MAX	.65	4.00	9.17
MIN	.11	.00	.00
NO OUTLIERS			

HOST MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SACCHAROMYCES D-3

DOSE LEVEL: POSITIVE CONTROL - EMS 350 MG/KG

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: MAY 1, 1972

ANIMAL NUMBER	A RAW CFU X 10E5/1.0ML	B TOTAL CFU SCREENED X 10E5/1.0ML	C TOTAL RECOMBINANTS /1.0ML	D RECOMB/CFU SCREENED X 10E-5
1	414.00	.41	21.00	50.72
2	263.00	.26	13.00	63.60
3	301.00	.30	20.00	66.45
4	299.00	.30	14.00	46.82
5	232.00	.23	11.00	47.41
6	326.00	.33	19.00	58.28
7	103.00	.10	8.00	77.67
8	266.00	.27	15.00	56.39
9	193.00	.19	12.00	62.18
10	392.00	.39	22.00	56.12

TOTAL

2.61

100.00

NO. OF ANIMALS EQUALS 10

MEAN C/MEAN B = 56.96

	COL. B (X 10E5)	COL. C (X 10E0)	COL. D (X 10E-5)
MEAN	.28	16.00	58.57
RANGE	.31	14.00	30.85
MAX	.41	22.00	77.67
MIN	.10	8.00	46.82

* SUMMARY WITH OUTLIERS REMOVED

MEAN C/MEAN B = 56.17

	COL. B (X 10E5)	COL. C (X 10E0)	COL. D (X 10E-5)
MEAN	.20	16.69	56.94
RANGE	.22	11.00	19.12
MAX	.41	22.00	66.45
MIN	.19	11.00	46.82

HOST MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SACCHAROMYCES D-3

DOSE LEVEL: LOW - 50 MG/KG

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: MAY 1, 1972

ANIMAL NUMBER	A RAW CFU X 10E5/1.0ML	B TOTAL CFU SCREENED X 10E5/1.0ML	C TOTAL RECOMBINANTS /1.0ML	D RECOMB/CFU SCREENED X 10E-5
1	308.00	.31	2.00	6.49
2	290.00	.29	2.00	6.90
3	473.00	.47	3.00	6.34
4	421.00	.42	2.00	4.75
5	633.00	.63	4.00	6.32
6	213.00	.22	1.00	4.59
7	423.00	.42	1.00	2.36
8	287.00	.29	1.00	3.48
9	531.00	.53	2.00	3.77

TOTAL 3.58 18.00

NO. OF ANIMALS EQUALS 9

NO. OF DEAD ANIMALS EQUALS 1

MEAN C/MEAN B = 5.02

	COL. B (X 10E5)	COL. C (X 10E0)	COL. D (X 10E-5)
MEAN	.40	2.00	5.00
RANGE	.41	3.00	4.53
MAX	.63	4.00	6.90
MIN	.22	1.00	2.36

NO OUTLIERS

HOST MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SACCHAROMYCES D-3

DOSE LEVEL: INTERMEDIATE - 500 MG/KG

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: MAY 1, 1972

ANIMAL NUMBER	A RAW CFU X 10E5/1.0ML	B TOTAL CFU SCREENED X 10E5/1.0ML	C TOTAL RECOMBINANTS /1.0ML	D RECOMB/CFU SCREENED X 10E-5
1	230.00	.23	2.00	8.70
2	182.00	.18	1.00	5.00
3	287.00	.29	3.00	10.45
4	390.00	.39	3.00	7.69
5	243.00	.24	3.00	12.35
6	600.00	.60	7.00	11.67
7	199.00	.20	1.00	5.03
8	433.00	.43	1.00	2.31
TOTAL		2.58	21.00	

NO. OF ANIMALS EQUALS 8

NO. OF DEAD ANIMALS EQUALS 2

MEAN C/MEAN B = 8.19

	COL. B (X 10E5)	COL. C (X 10E0)	COL. D (X 10E-5)
MEAN	.32	2.63	7.96
RANGE	.42	6.00	10.04
MAX	.60	7.00	12.35
MIN	.18	1.00	2.31
NO OUTLIERS			

HOST MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SACCHAROMYCES D-

DOSE LEVEL: HIGH - 5000 MG/KG

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: MAY 1, 1972

ANIMAL NUMBER	A RAW CFU X 10E5/1.0ML	B TOTAL CFU SCREENED X 10E5/1.0ML	C TOTAL RECOMBINANTS /1.0ML	D RECOMP/CFU SCREENED X 10E-5	
1	521.00	.52	7.00	13.44	*
2	507.00	.51	4.00	7.66	
3	382.00	.38	2.00	5.24	
4	520.00	.52	2.00	6.25	
5	473.00	.47	3.00	6.34	
6	268.00	.27	3.00	10.42	
7	203.00	.20	1.00	4.93	
8	521.00	.52	4.00	7.66	
9	222.00	.22	1.00	4.50	
TOTAL		3.44	27.00		

NO. OF ANIMALS EQUALS 9
TOTAL SCREENED OUT OF RANGE EQUALS 1

MEAN C/MEAN B = 7.85

	COL. B (X 10E5)	COL. C (X 10E0)	COL. D (X 10E-5)
MEAN	.38	3.00	7.41
RANGE	.22	6.00	8.93
MAX	.52	7.00	13.44
MIN	.20	1.00	4.50

* SUMMARY WITH OUTLIERS REMOVED

MEAN C/MEAN B = 6.80

	COL. B (X 10E5)	COL. C (X 10E0)	COL. D (X 10E-5)
MEAN	.38	2.58	6.66
RANGE	.22	3.00	5.91
MAX	.52	4.00	10.42
MIN	.20	1.00	4.50

HOST MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SACCHAROMYCES D-3

DOSE LEVEL: NEGATIVE CONTROL - SUBACUTE TRIALS

TREATMENT: IN VIVO, ORAL, ACUTE

DATE STARTED: MAY 5, 1972

ANIMAL NUMBER	A RAW CFU X 10E5/1.0ML	B TOTAL CFU SCREENED X 10E5/1.0ML	C TOTAL RECOMBINANTS /1.0ML	D RECOMB/CFU SCREENED X 10E-5
1	243.00	.24	1.00	4.12
2	428.00	.43	2.00	4.67
3	193.00	.19	1.00	5.18
4	207.00	.21	1.00	4.83
5	351.00	.35	2.00	5.70
6	333.00	.33	1.00	3.00
7	186.00	.19	.00	.00
8	291.00	.29	2.00	6.87
9	411.00	.41	3.00	7.30
10	382.00	.36	1.00	2.62
TOTAL		3.02	14.00	

NO. OF ANIMALS EQUALS 10

MEAN C/MEAN B = 4.63

	COL. B (X 10E5)	COL. C (X 10E0)	COL. D (X 10E-5)
MEAN	.30	1.40	4.43
RANGE	.24	3.00	7.30
MAX	.43	3.00	7.30
MIN	.19	.00	.00

* SUMMARY WITH OUTLIERS REMOVED

MEAN C/MEAN B = 4.93

	COL. B (X 10E5)	COL. C (X 10E0)	COL. D (X 10E-5)
MEAN	.32	1.50	4.2
RANGE	.43	2.00	4.68
MAX	.43	3.0	7.30
MIN	.19	1.00	2.62

TERMINAL PRINT FILE

FILE NO: 0000007, ,60,10000
 ROWS = 200

PAPER PRINT ON SIX-PART PAPER

HOST-MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SACCHAROMYCES D-7

DOSE LEVEL: LOW - 50 MG/KG

TREATMENT: IN VIVO, ORAL, SUBACUTE

DATE STARTED: MAY 8, 1972

ANIMAL NUMBER	A RAW CFU X 10E5/1.0ML	B TOTAL CFU SCREENED X 10E5/1.0ML	C TOTAL RECOMBINANTS /1.0ML	D RECOMB/CFU SCREENED X 10E-5
1	125.00	.12	.00	.00
2	315.00	.31	1.00	3.17
3	189.00	.19	1.00	5.29
4	153.00	.15	.00	.00
5	368.00	.37	2.00	5.43
6	145.00	.14	1.00	6.90
7	327.00	.35	3.00	9.17
8	149.00	.15	1.00	6.71
9	382.00	.35	1.00	2.62
TOTAL		2.15	10.00	

NO. OF ANIMALS EQUALS 9

TOTAL SCREENED OUT OF RANGE EQUALS 1

MEAN C/MEAN B = 4.64

	COL. B (X 10E5)	COL. C (X 10E0)	COL. D (X 10E-5)
MEAN	.24	1.11	4.37
RANGE	.16	3.00	9.17
MAX	.38	3.00	9.17
MIN	.02	.00	.00

NO OUTLIERS

HOST MEDIATED ASSAY REPORT SHEET

COMPOUND: FDA 71-40

ORGANISM: SACCHAROMYCES D-

DOSE LEVEL: HIGH - 5000 MG/KG

TREATMENT: IN VIVO, ORAL, SUBACUTE

DATE STARTED: MAY 5, 1972

ANIMAL NUMBER	A RAW CFU X 10E5/1.0ML	B TOTAL CFU SCREENED X 10E5/1.0ML	C TOTAL RECOMBINANTS /1.0ML	D RECOMB/CFU SCREENED X 10E-5
1	207.00	.21	1.00	4.83
2	422.00	.42	2.00	4.74
3	276.00	.26	1.00	3.62
4	413.00	.41	2.00	4.64
5	149.00	.15	.00	.00
6	247.00	.25	1.00	4.05
7	162.00	.16	1.00	6.17
8	412.00	.41	1.00	2.43
9	208.00	.21	1.00	4.81
10	563.00	.56	3.00	5.33
TOTAL		3.06	13.00	

NO. OF ANIMALS EQUALS 10

MEAN C/MEAN B = 4.25

	COL. B (X 10E5)	COL. C (X 10E0)	COL. D (X 10E-5)
MEAN	.31	1.30	4.08
RANGE	.41	3.00	6.17
MAX	.56	3.00	6.17
MIN	.15	.00	.00

* SUMMARY WITH OUTLIERS REMOVED

MEAN C/MEAN B = 4.47

	COL. B (X 10E5)	COL. C (X 10E0)	COL. D (X 10E-5)
MEAN	.32	1.44	4.54
RANGE	.40	2.00	3.75
MAX	.36	3.00	6.17
MIN	.16	1.00	2.43

3. Cytogenetics

In vivo

(1) Acute study

The chromosomal abnormalities observed in the positive controls were significantly higher than either the negative controls or the compound. The percentage of aberrations observed in the compound dosage groups was within the normal negative control values. The frequency of breaks in the negative controls was well within the range that we have seen in the past (0-6%). Mitotic indices were normal.

(2) Subacute study

The only aberrations observed in these groups were 3% breaks in the negative controls and 2% breaks in the high dose level. These are within normal limits. Mitotic indices were normal.

In vitro

Anaphase preparations were examined in this test. The positive control compound produced a significantly higher percentage of aberrations on the chromosomes than the negative control or the test compound. Depression of the mitotic index due to the positive control was not as pronounced as in the in vivo test. The effect of the compound on the cells observed was negative. Negative controls were well within normal limits.

CYTOGENETICS

SUMMARY SHEETS

CONTRACT FDA 71-268

COMPOUND FDA 71-40

Dilauryl Thiodipropionic Acid



BIONETICS

DILAURYL THIODIPROPIONIC ACID
FDA 71-40
ACUTE STUDY
METAPHASE SUMMARY SHEET

<u>Compound</u>	<u>Dosage (mg/kg)</u>	<u>Time*</u>	<u>No. of Animals</u>	<u>No. of Cells</u>	<u>Mitotic*** Index %</u>	<u>% Cells with Breaks</u>	<u>% Cells with Reunion</u>	<u>% Cells Other Aber.**</u>	<u>% Cells with aber.</u>
Negative Control	saline	6	3	150	9	0	0	0	0
		24	3	150	8	1	0	0	1
		48	3	150	6	5	0	0	5
Low Level	50	6	5	250	12	0	0	0	0
		24	5	250	10	0	0	0	0
		48	5	250	10	0	0	0	0
Intermediate Level	500	6	5	250	13	0	0	0	0
		24	5	250	7	3	0	0	3
		48	5	250	8	0	0	0	0
High Level	5000	6	5	250	12	0	0	0	0
		24	5	250	13	1	0	0	1
		48	5	250	13	2	0	0	2
Positive Control(TEM)	0.3	48	5	250	4	22	9	3(a)	31

*Time of sacrifice after injection (hours)

**Cells that have polyploidy (P), pulverization (pp), or greater than 10 aberrations (a).

*** % of cells in mitosis: 500 cells observed/animal.

DILAURYL THIODIPROPIONIC ACID
FDA 71- 40
SUBACUTE STUDY
METAPHASE SUMMARY SHEET

<u>Compound</u>	<u>Dosage*</u> <u>(mg/kg)</u>	<u>No. of</u> <u>Animals</u>	<u>No. of</u> <u>Cells</u>	<u>Mitotic***</u> <u>Index %</u>	<u>% Cells</u> <u>with</u> <u>Breaks</u>	<u>% Cells</u> <u>with</u> <u>Reunion</u>	<u>% Cells</u> <u>Other</u> <u>Aber.**</u>	<u>% Cells</u> <u>with</u> <u>aber.</u>
Negative Control	saline	3	150	12	3	0	0	3
Low Level	50	5	250	13	0	0	0	0
Intermediate Level	500	5	250	13	0	0	0	0
High Level	5000	5	250	10	2	0	0	2

*Dosage 1X/day X 5 days

**Cells that have polyploidy (P), pulverization (pp), or greater than 10 aberrations (a).

***% of cells in mitosis:500 cells observed/animal.

DILAURYL THIODIPROPIONIC ACID
FDA 71- 40
ANAPHASE SUMMARY SHEET

<u>Compound</u>	<u>Dosage (mcg/ml)</u>	<u>Mitotic** Index</u>	<u>No. of Cells</u>	<u>% Cells with Acentric Frag.</u>	<u>% Cells with Bridges</u>	<u>% Multipolar Cells</u>	<u>% Cells Other Aber.*</u>	<u>% Cells with aber.</u>
Low Level	5	2	100	0	0	0	0	0
Medium Level	50	1	100	0	0	0	0	0
High Level	500	5	100	0	0	0	0	0
Negative Control	saline	4	100	1	0	0	0	1
Positive Control (TEM)	0.1	2	100	13	6	0	0	19

*Cells that have polyploidy (P), pulverization (pp), or greater than 10 aberrations (a).

**% of cells in mitosis:200 cells observed/dose level.

4. Dominant Lethal Assay

The interpretation of these data was made by Dr. David Brusick, Assistant Professor of Microbiology, Howard University, Washington, D.C., as a consultant to LBI.

a. Fertility Index

Acute Study - All the experimental groups were shown to differ significantly from the control group in week 7, having a lower fertility rate than expected.

Subacute Study - The low and high dose groups were shown to differ significantly from the control in week 3, with higher fertility rates than expected. Week 7 showed the same results as the acute study. Significant linear relationships with dose were shown for both of these weeks.

b. Average number of implantations per pregnant female

Acute Study - Significant differences in the experimental groups from the control group were seen in weeks 1, 3, 4, 6, and 7; decreases were shown in weeks 1, 3, 4, and 7. A significant relationship to dose was shown in weeks 1 and 3.

Subacute Study - A significant relationship with dose was shown in week 6, where the average implantations increased with dosage. The intermediate dose of week 7 showed a significant increase. The intermediate dose of week 2 was significantly decreased.

c. Average corpora lutea per pregnant female

Acute Study - A significant decrease in the intermediate dose group from the control group was shown in week 3. In week 4 the low and high dose groups showed significant decreases, and in the 8th week all experimental groups showed significant decreases. The results in all of these weeks were significantly related to dose.

Subacute Study - The intermediate dose group showed significant increases in weeks 6 and 7 and the high dose group showed a significant increase in week 6. In both weeks a significant relationship with dose was shown. Week 5 showed significant increases at the low and high doses which are dose related. The high dose of week 1 was significantly decreased.



d. Average preimplantation losses per pregnant female

Acute Study - Highly significant, dose related increases in the experimental groups were shown in weeks 1 and 7. Significant dose related decreases were shown in week 8.

Subacute Study - Significant, dose related increases in the intermediate and high dose groups over the control were shown in week 7. The low dose group showed a significant increase over the control group in week 6. The high dose produced a significant decrease in week 1.

e. Average resorptions per pregnant female

Acute Study - The intermediate dose group in week 1 and the high dose in week 7 showed a significant increase over the control. In week 4 the intermediate and high dose groups showed significant dose related decreases from the control.

Subacute Study - Decreases at the high doses noted in weeks 1 and 2 were shown to have a significant relationship with dose. The low and high dose groups showed significant increases over the control group in week 3. In week 4 the intermediate dose group showed a significant decrease from the control.

f. Proportion of females with one or more dead implantations

Acute Study - The intermediate dose group showed significant increase in week 1. In week 4 both the intermediate and high dose groups showed significant dose related decreases.

Subacute Study - The high dose group differed significantly in weeks 1, 2, and 3, showing lower in weeks 1 and 2 and higher in week 3. The intermediate group was seen to have a significant decrease in week 4.

g. Proportion of females with two or more dead implantations

Acute Study - Significant reduction at intermediate dose at week 3.

Subacute Study - In week 3 the high dose group showed a significant increase.

h. Dead implants / Total implants

Acute Study - Significant increases at the intermediate dose of week 1 and the high dose at week 7.

Subacute Study - Significant increases are observed for the low and high doses of week 3. Significant decreases were obtained at the high doses of weeks 1 and 2 and the intermediate dose of week 4.

DOMINANT LETHAL SUMMARY TABLES

CONTRACT FDA 71-268

COMPOUND FDA 71-40

DILAURYL THIODIPROPIONIC ACID



BIONETICS

TABLE I
COMPOUND 40 STUDY ACUTE

FERTILITY INDEX

OG OST	ARITH DOSE	HISTORICAL CONTROL	NEGATIVE CONTROL	DOSE LEVEL 50.000 MG/KG	DOSE LEVEL 500.000 MG/KG	DOSE LEVEL 5000.000 MG/KG	POSITIVE CONTROL
!	1	103/159=0.69	13/20=0.65	12/20=0.60	13/19=0.69	9/20=0.45*	10/18=0.56
!	2	119/159=0.75	16/19=0.85	15/20=0.75	16/19=0.85	13/18=0.73	11/19=0.58
	3	119/159=0.76	16/20=0.80	12/19=0.64	14/20=0.70	15/20=0.75	11/20=0.55
	4	116/160=0.85	18/20=0.90	18/20=0.90	19/20=0.95	17/20=0.85	16/20=0.80
!	5	127/159=0.80	19/20=0.95	19/20=0.95	20/20=1.00*	19/20=0.95	18/20=0.90
!	6	128/159=0.81	13/19=0.69	14/20=0.70	13/18=0.73	11/18=0.62	19/20=0.95*
	7	113/157=0.85	20/20=1.00	11/20=0.55**	10/20=0.50**	14/20=0.70**	20/20=1.00
	8	133/160=0.84	18/20=0.90	13/19=0.69	17/20=0.85	14/20=0.70	16/20=0.80

SYMBOLS ON FIRST LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE NEGATIVE CONTROL GROUP

SYMBOLS ON SECOND LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE HISTORICAL CONTROL GROUP

ONE !,* = SIGNIFICANT AT P LESS THAN 0.05

TWO !,* = SIGNIFICANT AT P LESS THAN 0.01

* SIGNIFICANTLY DIFFERENT FROM CONTROL

! SIGNIFICANT LINEAR RELATIONSHIP WITH ARITH OR LOG DOSE (HEADING OF COLUMN)

TABLE 11
COMPOUND 40 STUDY ACUTE

AVERAGE NUMBER OF IMPLANTATIONS PER PREGNANT FEMALE

LOG ABIRTH	HISTORICAL	NEGATIVE	DOSE LEVEL	DOSE LEVEL	DOSE LEVEL	POSITIVE	
DOSE DOSE	CONTROL	CONTROL	50.000 MG/KG	500.000 MG/KG	5000.000 MG/KG	CONTROL	
!	1	1351/109=12.4	171/13=13.2	134/12=11.2	159/13=12.2	96/9=10.7@D	52/10= 5.2**
!	2	1427/119=12.0	183/16=11.4	176/15=11.7	203/16=12.7	155/13=11.9	96/11= 7.8**
!	3	1435/119=12.1	217/16=13.6 **@DI	148/12=12.3	165/14=11.8*@@D	186/15=12.4@D	93/11= 8.5**
!	4	1626/136=12.0	222/18=12.3	182/18=10.1*@@D *@@D	222/19=11.7	181/17=10.7*@D @D	171/16=10.7**
	5	1646/127=11.5	221/19=11.6	228/19=12.0	236/20=11.8	227/19=12.0	205/18=11.4
	6	1512/128=11.8	138/13=10.6	178/14=12.7*@I *@I	156/13=12.0	126/11=11.5	167/19= 8.8@D **
	7	1626/133=12.2	252/20=12.6	133/11=12.1	113/10=11.3@D *@D	167/14=11.9	205/20=10.3*@@ **
	8	1551/133=11.7	213/18=11.8	157/13=12.1	198/17=11.7	160/14=11.4	205/16=12.8 *DI

SYMBOLS ON FIRST LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE NEGATIVE CONTROL GROUP

SYMBOLS ON SECOND LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE HISTORICAL CONTROL GROUP

% AND * = TWO-TAILED TEST
! AND @ = ONE-TAILED TEST

19 1, 5, , * = SIGNIFICANT AT P LESS THAN 0.05
2, 0, 1, 8, , * = SIGNIFICANT AT P LESS THAN 0.01

1, 2 SIG. DIFFERENT FROM CONTROL
0, 1 SIG. RELATIONSHIP WITH ABIRTH OF LOG DOSE (HEADING OF COLUMN)

TABLE III
COMPOUND 40 STUDY ACUTE

AVERAGE CORPORA LUTEA PPP PREGNANT FEMALE

LOG DOSE	APITH DOSE	HISTORICAL CONTROL	NEGATIVE CONTROL	DOSE LEVEL 50.000 MG/KG	DOSE LEVEL 500.000 MG/KG	DOSE LEVEL 5000.000 MG/KG	POSITIVE CONTROL
	1	1504/109=13.8	173/13=13.3	168/12=14.0	184/13=14.2	121/9=13.4	31/10=9.1***
!	2	1588/119=13.3	202/16=12.6	185/15=12.3	204/16=12.8	160/13=12.3 @D	129/11=11.7 **
!	3	1565/119=13.2	217/16=13.6	151/12=12.6	169/14=12.1* *@D	190/15=12.7	116/11=10.6* *@D
S ! S&!! S&!!	4	1784/136=13.1	225/18=12.5	199/18=11.0* **@D	222/19=11.7 **@D	187/17=11.0* **@D	160/16=11.3* **
	5	1648/127=13.0	230/19=12.1 @D	234/19=12.3	247/20=12.4	234/19=12.3	209/18=11.6 **
S&!! !	6	1689/128=13.2	180/13=13.9	221/14=15.8 **@DI	194/13=14.9 @I	166/11=15.1 *@DI	213/19=11.2* **
	7	1767/133=13.3	255/20=12.8	156/11=14.2@I	151/10=15.1* *@I	185/14=13.2	250/20=12.5
S&!!	8	1823/133=13.7	319/18=17.7 **@DI	176/13=13.5* **@D	242/17=14.2* *@D	203/14=14.5* *@D	243/16=15.2

SYMBOLS ON FIRST LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE NEGATIVE CONTROL GROUP

SYMBOLS ON SECOND LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE HISTORICAL CONTROL GROUP

S AND * = TWO-TAILED TEST
! AND @ = ONE-TAILED TEST

ONE !, S, *, * = SIGNIFICANT AT P LESS THAN 0.05
TWO !, S, *, * = SIGNIFICANT AT P LESS THAN 0.01

* @ SIGNIFICANTLY DIFFERENT FROM CONTROL
* ! SIGNIFICANT RELATIONSHIP WITH APITH OF LOG DOSE (HEADING OF COLUMN)

TABLE IV
COMPOUND 40 STUDY ACUTE

AVERAGE PREIMPLANTATION LOSSES PER PREGNANT FEMALE

OG APITH OSE DOSE	HISTORICAL CONTROL	NEGATIVE CONTROL	DOSE LEVEL 50.000 MG/KG	DOSE LEVEL 500.000 MG/KG	DOSE LEVEL 5000.000 MG/KG	POSITIVE CONTROL
8!!! !!	1 153/109= 1.4	2/13= 0.2 **@D	34/12= 2.8**@DI	25/13= 1.9**@DI	25/ 9= 2.8**@DI	39/10= 3.9*** **@D
8!!!	2 161/119= 1.4	19/16= 1.2	9/15= 0.6 *@D	1/16= 0.1 **@D	5/13= 0.4 **@D	43/11= 3.9*** *DI
8!!! 8 !	3 130/119= 1.1	0/16= 0.0 **@D	3/12= 0.3 **@D	4/14= 0.3 **@D	4/15= 0.3 **@D	23/11= 2.1*** **@D
8!!! 8 !	4 158/136= 1.2	3/18= 0.2 **@D	16/18= 0.9	0/19= 0.0 **@D	6/17= 0.4 **@D	9/16= 0.6
8!!! !	5 182/127= 1.4	9/19= 0.5 **@D	6/19= 0.3 **@D	11/20= 0.6 *@D	7/19= 0.4 **@D	4/18= 0.2 ***
8!!! 88!!!	6 177/128= 1.4	42/13= 3.2 *DI	43/14= 3.1 **@DI	38/13= 2.9 **@DI	40/11= 3.6 **@DI	46/19= 2.4
8!!! 8!!!	7 141/133= 1.1	3/20= 0.2 **@D	23/11= 2.1**@DI **@DI	38/10= 3.8**@DI **@DI	18/14= 1.3**@DI	45/20= 2.3*** ***
!	8 272/133= 2.1	106/18= 5.9 **@DI	19/13= 1.5**@D	44/17= 2.6*@D	43/14= 3.1@D	38/16= 2.4**@D

SYMBOLS ON FIRST LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE NEGATIVE CONTROL GROUP

SYMBOLS ON SECOND LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE HISTORICAL CONTROL GROUP

8 AND * = TWO-TAILED TEST
! AND @ = ONE-TAILED TEST

ONE !, 8, , * = SIGNIFICANT AT P LESS THAN 0.05
TWO !, 8, , * = SIGNIFICANT AT P LESS THAN 0.01

2, 9 SIG. DIFFERENT FROM CONTROL
2, 1 SIG. RELATIONSHIP WITH APITH OF LOG DOSE (HEADING OF COLUMN)

AVERAGE RESORPTIONS (DEAD IMPLANTS) PER PREGNANT FEMALE

OG	ARITH		HISTORICAL	NEGATIVE	DOSE LEVEL	DOSE LEVEL	DOSE LEVEL	POSITIVE
CSE	DOSE	WEEK	CONTROL	CONTROL	50.000 MG/KG	500.000 MG/KG	5000.000 MG/KG	CONTROL
!!		1	28/109=0.26	3/13=0.24	5/12=0.42	11/13=0.85* θ I * $\theta\theta$ I	3/ 9=0.34	42/10=4.20** $\theta\theta$ I ** $\theta\theta$ I
8 !! 8 !		2	53/119=0.45	4/16=0.25	4/15=0.27	3/16=0.19 θ D	17/13=1.31	36/11=3.28** $\theta\theta$ I ** $\theta\theta$ I
		3	61/119=0.52	10/16=0.63	13/12=1.09	2/14=0.15 * $\theta\theta\theta$ D	15/15=1.00	14/11=1.28 * θ I
8!! 8!! 8 !!		4	62/136=0.46	12/18=0.67	5/18=0.28	0/19=0.0 * $\theta\theta\theta$ D ** $\theta\theta\theta$ D	1/17=0.06* $\theta\theta$ D ** $\theta\theta\theta$ D	73/16=4.57** $\theta\theta\theta$ I ** $\theta\theta\theta$ I
8!! 8 !		5	74/127=0.59	6/19=0.32	3/19=0.16 ** $\theta\theta\theta$ D	7/20=0.35	2/19=0.11 ** $\theta\theta\theta$ D	16/18=0.89
!		6	58/128=0.46	2/13=0.16 * $\theta\theta$ D	4/14=0.29	3/13=0.24	2/11=0.19	23/19=1.23** $\theta\theta\theta$ I ** $\theta\theta\theta$ I
!		7	65/133=0.49	1/20=0.05 ** $\theta\theta\theta$ D	3/11=0.28	6/10=0.60	8/14=0.58 θ I	1/20=0.05 ** $\theta\theta\theta$ D
		8	71/133=0.54	5/18=0.28	5/13=0.39	10/17=0.59	5/14=0.36	13/16=0.82

SYMBOLS IN FIRST LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE NEGATIVE CONTROL GROUP

SYMBOLS ON SECOND LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE HISTORICAL CONTROL GROUP

S AND * = TWO-TAILED TEST
! AND @ = ONE-TAILED TEST

ONE !,8, ,* = SIGNIFICANT AT P LESS THAN 0.05
TWO !,8, ,* = SIGNIFICANT AT P LESS THAN 0.01

0-9 SIG - NOT IN DIFFERENT FROM CONTROL

0-1 SIG - NO SIGNIFICANT RELATIONSHIP WITH EITHER OF LOS DOSE (ENDING OF COLUMN)

TABLE VI
COMPOUND 40 STUDY ACUTE

PROPORTION OF FEMALES WITH ONE OR MORE DEAD IMPLANTATIONS

OG	ARITH	HISTORICAL	NEGATIVE	DOSE LEVEL	DOSE LEVEL	DOSE LEVEL	POSITIVE
OSE	DOSE	CONTROL	CONTROL	50.000 MG/KG	500.000 MG/KG	5000.000 MG/KG	CONTROL
	1	24/109=0.23	3/13=0.24	3/12=0.25	8/13=0.62* **	3/9=0.34	8/10=0.80** **
	2	34/119=0.32	3/16=0.19	4/15=0.27	3/16=0.19	6/13=0.47	7/11=0.64* *
	3	39/119=0.33	5/16=0.32	2/12=0.17	2/14=0.15	3/15=0.20	7/11=0.64 *
!	4	46/136=0.34	6/18=0.34	5/18=0.28	0/19=0.0 ** **	1/17=0.06* *	14/16=0.88** **
!	5	45/127=0.36	4/19=0.22	2/19=0.11 *	4/20=0.20	2/19=0.11 *	8/18=0.45
!	6	44/128=0.35	2/13=0.16	3/14=0.22	3/13=0.24	2/11=0.19	13/19=0.69** **
	7	46/133=0.35	1/20=0.05 **	3/11=0.28	1/10=0.10	4/14=0.29	1/20=0.05 **
	8	50/133=0.38	4/18=0.23	4/13=0.31	7/17=0.42	5/14=0.36	6/16=0.38

SYMBOLS ON FIRST LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE NEGATIVE CONTROL GROUP

SYMBOLS ON SECOND LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE HISTORICAL CONTROL GROUP

ONE !,* - SIGNIFICANT AT P LESS THAN 0.05

TWO !,* - SIGNIFICANT AT P LESS THAN 0.01

* SIGNIFICANTLY DIFFERENT FROM CONTROL

! SIGNIFICANT LINEAR RELATIONSHIP WITH ARITH OR LOG DOSE (HEADING OF COLUMN)

TABLE VII
COMPOUND 40 STUDY CONT'D

PROPORTION OF FEMALES WITH TWO OR MORE BEAD IMPLANTATIONS

LOG ARITH DOSE DOSE	HISTORICAL CONTROL	NEGATIVE CONTROL	DOSE LEVEL 50.000 MG/KG	DOSE LEVEL 500.000 MG/KG	DOSE LEVEL 5000.000 MG/KG	POSITIVE CONTROL
1	3/109=0.03	0/13=0.0	2/12=0.17 *	2/13=0.16 *	0/9=0.0	7/10=0.70**
2	14/119=0.12	1/16=0.07	0/15=0.0	0/16=0.0	2/13=0.16	7/11=0.64**
3	17/119=0.15	4/16=0.25	1/12=0.09	0/14=0.0 *	1/15=0.07	5/11=0.46**
4	12/136=0.09	3/18=0.17	0/18=0.0	0/19=0.0	0/17=0.0	13/16=0.82**
5	16/127=0.15	2/19=0.11	1/19=0.06	1/20=0.05	0/19=0.0	4/18=0.23
6	13/128=0.11	0/13=0.0	1/14=0.08	0/13=0.0	0/11=0.0	6/19=0.32*
7	14/133=0.11	0/20=0.0	0/11=0.0	1/10=0.10	2/14=0.15	0/20=0.0
8	18/133=0.14	1/18=0.06	1/13=0.08	2/17=0.12	0/14=0.0	4/16=0.25

SYMBOLS ON FIRST LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE NEGATIVE CONTROL GROUP

SYMBOLS ON SECOND LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE HISTORICAL CONTROL GROUP

ONE !,* = SIGNIFICANT AT P LESS THAN 0.05

TWO !,* = SIGNIFICANT AT P LESS THAN 0.01

* SIGNIFICANTLY DIFFERENT FROM CONTROL

! SIGNIFICANT LINEAR RELATIONSHIP WITH ARITH OF LOG DOSE (HEADING OF COLUMN)

[illegible]

DEAD IMPLANTS / TOTAL IMPLANTS

WEEK	HISTOPICAL	NEGATIVE	DOSE LEVEL	DOSE LEVEL	DOSE LEVEL	POSITIVE
	CONTROL	CONTROL	50.000 MG/KG	500.000 MG/KG	5000.000 MG/KG	CONTROL
1	28/1351=0.03	3/171=0.02	5/134=0.04	11/159=0.07***I ***I	3/ 96=0.04	42/ 52=0.81** **
2	53/1427=0.04	4/183=0.03	4/176=0.03	3/203=0.02 ***DD	17/155=0.11	36/ 86=0.42** **
3	61/1435=0.05	10/217=0.05	13/148=0.09	2/165=0.02 ***DD	15/186=0.09	14/ 93=0.16** **I
4	62/1626=0.04	12/222=0.06	5/182=0.03	0/222=0.0 DD ***DD	1/181=0.01 ***DD	73/171=0.43** **
5	74/1466=0.06	6/221=0.03 **D	3/228=0.02 ***DD	7/236=0.03	2/227=0.01 ***DD	16/205=0.08** **
6	58/1512=0.04	2/138=0.02	4/178=0.03 DD	3/156=0.02 **D	2/126=0.02	23/167=0.14** **
7	65/1626=0.04	1/252=0.01 ***DD	3/133=0.03	6/113=0.06	8/167=0.05DI	1/205=0.01DI **/
8	71/1551=0.05 DD	5/213=0.03	5/157=0.04	10/198=0.06	5/160=0.04	13/205=0.07

SYMBOLS IN FIRST LINE DENOTE SIGNIFICANT DIFFERENCES USING THE NEGATIVE CONTROL GROUP

SYMBOLS ON SECOND LINE DENOTE SIGNIFICANT DIFFERENCES USING THE HISTORICAL CONTROL GROUP

* = TWO-TAILED TEST

τ = ONE-SAMPLE TEST

ONE *,P = SIGNIFICANT AT P LESS THAN 0.05

TSO #, 2 = SIGNIFICANT AT P LESS THAN 0.01

* @ SIG SIGNIFICANTLY DIFFERENT FROM CONTROL

TABLE I
COMPOUND 40 STUDY SUMMARY

FERTILITY INDEX

OG	ARITH	HISTORICAL	NEGATIVE	DOSE LEVEL	DOSE LEVEL	DOSE LEVEL
OSL	DOSE	CONTROL	CONTROL	50.000 MG/KG	500.000 MG/KG	5000.000 MG/KG
	1	114/159=0.66	13/19=0.69	12/19=0.64	8/19=0.43*	11/20=0.55
	2	118/160=0.74	14/20=0.70	18/20=0.90	13/20=0.65	14/20=0.70
	3	119/159=0.75	12/19=0.64	19/20=0.90*	16/20=0.80	19/20=0.95*
	4	120/154=0.78	16/19=0.85	16/20=0.80	14/19=0.74	19/20=0.95
	5	122/157=0.78	18/20=0.90	19/20=0.95	15/19=0.79	19/20=0.95
	6	136/159=0.86	18/19=0.95	14/20=0.70*	16/20=0.80	20/20=1.00
!	7	125/155=0.88	19/19=1.00	13/20=0.65**	12/20=0.60**	13/20=0.65**
!				*	**	*

SYMBOLS ON FIRST LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE NEGATIVE CONTROL GROUP

SYMBOLS ON SECOND LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE HISTORICAL CONTROL GROUP

ONE !,* = SIGNIFICANT AT P LESS THAN 0.05

TWO !,* = SIGNIFICANT AT P LESS THAN 0.01

* SIGNIFICANTLY DIFFERENT FROM CONTROL

! SIGNIFICANT LINEAR RELATIONSHIP WITH ARITH OR LOG DOSE (HEADING OF COLUMN)

TABLE II
COMPOUND 40 STUDY SUBCHUTE

AVERAGE NUMBER OF IMPLANTATIONS PER PREGNANT FEMALE

LOG DOSE	ARITH DOSE	HISTORICAL CONTROL	NEGATIVE CONTROL	DOSE LEVEL 50.000 MG/KG	DOSE LEVEL 500.000 MG/KG	DOSE LEVEL 5000.000 MG/KG
!	!	1 1231/104=11.8	167/13=12.9	160/12=13.3	105/ 8=13.1	126/11=11.5
				**@@I	@I	
		2 1474/118=12.5	190/14=13.6	234/18=13.0	159/13=12.2@D	178/14=12.7
			@I			
		3 1465/119=11.8	139/12=11.6	225/18=12.5	189/16=11.8	226/19=11.9
		4 1414/120=11.8	191/16=11.9	193/16=12.1	177/14=12.6	232/19=12.2
		5 1462/122=12.0	219/18=12.2	241/19=12.7	195/15=13.0	233/19=12.3
					*@I	
!	!	6 1426/136=12.0	179/18= 9.9	135/14= 9.6	179/16=11.2	230/20=11.5@I
			**@D@D	**@D@D		
!	!	7 1566/135=11.6	204/19=10.7	144/13=11.1	144/12=12.0@I	130/13=10.0
			@D			@D

SYMBOLS ON FIRST LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE NEGATIVE CONTROL GROUP

SYMBOLS ON SECOND LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE HISTORICAL CONTROL GROUP

@ AND * = TWO-TAILED TEST
! AND @ = ONE-TAILED TEST

ONE !, @, *, * = SIGNIFICANT AT P LESS THAN 0.05
TWO !, @, *, * = SIGNIFICANT AT P LESS THAN 0.01

*, @ SIGNIFICANTLY DIFFERENT FROM CONTROL
@, ! SIGNIFICANT RELATIONSHIP WITH ARITH OR LOG DOSE (HEADING OF COLUMN)

TABLE III
COMPOUND 40 STUDY SUBCUT

AVERAGE CORPORA LUTEA PER PREGNANT FEMALE

LOG DOSE	ARITH DOSE	HISTORICAL CONTROL	NEGATIVE CONTROL	DOSE LEVEL 50.000 MG/KG	DOSE LEVEL 500.000 MG/KG	DOSE LEVEL 5000.000 MG/KG
88!! 8 !	1	1385/104=13.3	171/13=13.2	167/12=13.9	112/ 8=14.0	126/11=11.5@D **@D
	2	1599/118=13.6	194/14=13.9	234/13=13.0	166/13=12.8	190/14=12.9
	3	1635/119=12.9	139/12=11.6 *@D	227/18=12.6	196/16=12.3	233/19=12.3
	4	1690/120=12.5	198/16=12.4	198/16=12.4	177/14=12.6	237/19=12.5
!	5	1654/122=12.7	219/18=12.2	248/19=13.1@I	195/15=13.0	250/19=13.2@I
! !	6	1609/136=13.3	193/18=10.7 **@D	173/14=12.4	200/16=12.5*@I	257/20=12.9**@@I
!	7	1711/135=12.7	215/19=11.3 *@D	154/13=11.9	169/12=14.1**@@I **@@I	158/13=12.2

SYMBOLS ON FIRST LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE NEGATIVE CONTROL GROUP

SYMBOLS ON SECOND LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE HISTORICAL CONTROL GROUP

@ AND * = TWO-TAILED TEST
! AND @ = ONE-TAILED TEST

ONE !, @, *, * = SIGNIFICANT AT P LESS THAN 0.05
TWO !, @, *, * = SIGNIFICANT AT P LESS THAN 0.01

*, @ SIGNIFICANTLY DIFFERENT FROM CONTROL

70 8, ! SIGNIFICANT RELATIONSHIP WITH ARITH OR LOG DOSE (HEADING OF COLUMN)

TABLE IV
COMPOUND 40 STUDY SUBCUTTE

AVERAGE PREIMPLANTATION LOSSES PER PREGNANT FEMALE

LOG ARITH DOSE DOSE	HISTORICAL CONTROL	NEGATIVE CONTROL	DOSE LEVEL 50.000 MG/KG	DOSE LEVEL 500.000 MG/KG	DOSE LEVEL 5000.000 MG/KG
! 1	154/104 = 1.5	4/13 = 0.3	7/12 = 0.6	7/8 = 0.9	0/11 = 0.00D
! 18!! 18!!		**00D	*0D		**00D
! 2	125/116 = 1.1	4/14 = 0.3	0/18 = 0.0	7/13 = 0.5	2/14 = 0.1
! 18!!		**00D	**00D		**00D
! 3	130/119 = 1.1	0/12 = 0.0	2/18 = 0.1	7/16 = 0.4	7/19 = 0.4
! 18!! 18!!		**00D	**00D	*0D	**00D
! 4	85/120 = 0.7	7/16 = 0.4	5/16 = 0.3	0/14 = 0.0	5/19 = 0.3
! 18!!			0D	**00D	0D
! 5	92/122 = 0.8	0/18 = 0.0	7/19 = 0.4	0/15 = 0.0	17/19 = 0.90I
! 18!!		**00D	0D	**00D	
! 6	163/136 = 1.4	14/18 = 0.8	38/14 = 2.7*0I	21/16 = 1.3	27/20 = 1.4
! 7	145/135 = 1.1	11/19 = 0.6	10/13 = 0.8	25/12 = 2.1*00I	28/13 = 2.2*00I
! 18!! 18!!				0I	*0I

SYMBOLS ON FIRST LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE NEGATIVE CONTROL GROUP

SYMBOLS ON SECOND LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE HISTORICAL CONTROL GROUP

! AND * = TWO-TAILED TEST
: AND @ = ONE-TAILED TEST

ONE !, @, * = SIGNIFICANT AT P LESS THAN 0.05
TWO !, @, * = SIGNIFICANT AT P LESS THAN 0.01

*, @ SIGNIFICANTLY DIFFERENT FROM CONTROL
S, ! SIGNIFICANT RELATIONSHIP WITH ARITH OR LOG DOSE (HEADING OF COLUMN)

PROPORTION OF FEMALES WITH ONE OR MORE DEAD IMPLANTATIONS

LOG ARITH DOSE DOSE	HISTORICAL CONTROL	NEGATIVE CONTROL	DOSE LEVEL 50.000 MG/KG	DOSE LEVEL 500.000 MG/KG	DOSE LEVEL 5000.000 MG/KG
1	31/104=0.30	7/13=0.54	3/12=0.25	3/8=0.38	1/11=0.10*
2	38/118=0.33	7/14=0.50	8/18=0.45	6/13=0.47	2/14=0.15*
!	42/119=0.36	2/12=0.17	9/18=0.50	7/16=0.44	11/19=0.58*
!	42/120=0.35	6/16=0.38	4/16=0.25	0/14=0.0 *	7/19=0.37
				**	
!!	54/122=0.45	5/18=0.28	3/19=0.16	2/15=0.14	3/19=0.16
!!			*	*	*
!	43/136=0.32	1/18=0.06	1/14=0.08	0/16=0.0	4/20=0.20
!		*		**	
7	42/135=0.32	3/19=0.16	4/13=0.31	1/12=0.09	3/13=0.24

SYMBOLS ON FIRST LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE NEGATIVE CONTROL GROUP

SYMBOLS ON SECOND LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE HISTORICAL CONTROL GROUP

ONE !,* = SIGNIFICANT AT P LESS THAN 0.05
TWO !,* = SIGNIFICANT AT P LESS THAN 0.01

* SIGNIFICANTLY DIFFERENT FROM CONTROL
! SIGNIFICANT LINEAR RELATIONSHIP WITH ARITH OF LOG DOSE (HEADING OF COLUMN)

TABLE VII
COMPOUND 40 STUDY SUMMARY

PROPORTION OF FEMALES WITH TWO OR MORE DEAD IMPLANTATIONS

LOG ARITH	HISTORICAL	NEGATIVE	DOSE LEVEL	DOSE LEVEL	DOSE LEVEL
DOSE DOSE	CONTROL	CONTROL	50.000 MG/KG	500.000 MG/KG	5000.000 MG/KG
1	8/104=0.08	1/13=0.08	1/12=0.09	1/8=0.13	0/11=0.0
2	10/118=0.09	4/14=0.29*	6/18=0.34**	1/13=0.08	1/14=0.08
!! !!	3	17/119=0.15	1/12=0.09	7/18=0.39*	8/19=0.43**
4	15/120=0.13	1/16=0.07	0/16=0.0	0/14=0.0	3/19=0.16
5	19/122=0.16	2/18=0.12	2/19=0.11	1/15=0.07	1/19=0.06
6	13/136=0.10	0/18=0.0	1/14=0.08	0/16=0.0	0/20=0.0
7	16/135=0.12	2/19=0.11	1/13=0.08	0/12=0.0	0/13=0.0

SYMBOLS ON FIRST LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE NEGATIVE CONTROL GROUP

SYMBOLS ON SECOND LINE DENOTE SIGNIFICANT RELATIONSHIPS AND DIFFERENCES USING THE HISTORICAL CONTROL GROUP

ONE !,* = SIGNIFICANT AT P LESS THAN 0.05

TWO !,* = SIGNIFICANT AT P LESS THAN 0.01

* SIGNIFICANTLY DIFFERENT FROM CONTROL

! SIGNIFICANT LINEAR RELATIONSHIP WITH ARITH OR LOG DOSE (HEADING OF COLUMN)

COMPOUND 40 STUDY SUMMARY

DEAD IMPLANTS / TOTAL IMPLANTS

	HISTORICAL CONTROL	NEGATIVE CONTROL	DOSE LEVEL 50.000 MG/KG	DOSE LEVEL 500.000 MG/KG	DOSE LEVEL 5000.000 MG/KG
1	42/1231=0.04	8/167=0.05	4/160=0.03	4/105=0.04	1/126=0.01 ^a * ^a ^a ^a
2	55/1474=0.05	12/190=0.10	31/234=0.14	7/159=0.05	3/178=0.02 ^a ^a ^a
3	64/1405=0.05	3/139=0.03	70/225=0.32* ^a ^a ^a * ^a ^a ^a	32/189=0.17	60/226=0.27* ^a ^a ^a * ^a ^a ^a
4	66/1414=0.05	7/191=0.04	4/193=0.03 * ^a ^a ^a	0/177=0.0	** ^a ^a ^a ^a 11/232=0.05 ** ^a ^a ^a ^a
5	77/1462=0.06	7/219=0.04 ^a ^a	5/241=0.03 ** ^a ^a ^a ^a	3/195=0.02 ** ^a ^a ^a ^a	4/233=0.02 * ^a ^a ^a ^a
6	12/1620=0.04	1/179=0.01 * ^a ^a ^a ^a	4/135=0.03	0/179=0.0 ** ^a ^a ^a ^a	4/230=0.02
7	70/1566=0.05	5/204=0.03	5/144=0.04	1/144=0.01 ** ^a ^a ^a ^a	3/130=0.03

SYMBOLS ON FIRST LINE DENOTE SIGNIFICANT DIFFERENCES USING
THE NEGATIVE CONTROL GROUP

SYMBOLS ON SECOND LINE DENOTE SIGNIFICANT DIFFERENCES USING
THE HISTORICAL CONTROL GROUP

* = TWO-TAILED TEST
^a = ONE-TAILED TEST

ONE *,^a = SIGNIFICANT AT P LESS THAN 0.05
TWO *,^a = SIGNIFICANT AT P LESS THAN 0.01

*,^a SIGNIFICANTLY DIFFERENT FROM CONTROL

II. APPENDICES (MATERIALS AND METHODS)

A. Animal Husbandry

1. Animals--Rats and Mice

Ten to twelve week old rats (280 to 350 g) and male mice (25-30 g) were fed a commercial 4% fat diet and water ad libitum until they were on experiment. Flow Laboratories random-bred, closed colony, Sprague-Dawley CD strain rats were used in the cytogenetic studies. Flow Laboratories ICR male mice were employed in the Host-Mediated Assay.

2. Preparation of Diet

A commercial 4% fat diet was fed to all animals. Periodic tests to verify the absence of coliforms, Salmonella and Pseudomonas sp. were performed.

3. Husbandry

Animals were held in quarantine for 4-11 days. Mice were housed five to a cage and rats one to five to a cage. Animals were identified by ear punch. Sanitary cages and bedding were used, and changed two times per week, at which time water containers were cleaned, sanitized and filled. Once a week, cages were repositioned on racks; racks were repositioned within rooms monthly. Personnel handling animals or working with animal facilities wore head covering and face masks, as well as suitable garments. Individuals with respiratory or other overt infections were excluded from the animal facilities.

B. Dosage Determination

1. Acute LD₅₀ and LD₅ Determination

Since the compounds proposed for testing are included in the



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food additive regulations as "generally recognized as safe" (GRAS), it was expected that a large number of them would be sufficiently non-toxic so that determination of an LD₅₀ or an LD₅ is of no practical value. In fact, this has been our experience with previously tested compounds from this list. In the case of these relatively non-toxic compounds, attempts were made to assure that the amounts to be administered would not affect the animals by means (mechanical, physical, etc.) related to their bulk rather than to their toxicity. In the cases of certain compounds where an LD₅₀ or an LD₅ were not determined, an exceedingly high concentration, 5 g/kg, was employed and accepted as the LD₅ level. In cases where the toxicity was high enough to allow determination of an LD₅₀, the following protocol was used.

Thirty rats of the strain chosen for studies described below and of approximately the age and weight specified were assigned at random to six groups. Each group was then given, using the chosen route of administration, one of a series of dosages of the test compound following a logarithmic dosage scheme. The series of dosages was derived from a consideration of whatever toxicity information was available for the particular test compound. The objective in selecting dosages was to choose values which would cause mortalities between 10% and 90%.

When information was inadequate to derive a suitable series of dosages, five rats were used to identify the proper range. Each of these was given one of a widely spaced (differing by 10X) series of doses. This was confidently expected to suffice for derivation of the series of dosages to be used in the LD₅₀ determination.

The mortalities observed when the series of dosages was given to the 30 rats were then subjected to a probit analysis and calculation of LD₅₀, LD₅, slope and confidence limits by the method of Litchfield and



Wilcoxon. The highest dose level used was either a finite LD₅ or 5000mg/kg. The intermediate level used was either 1/10 of the finite LD₅ or 500mg/kg. The low level used was either 1/100 of the finite LD₅ or 50 mg/kg.

2. Subacute Studies

Subacute doses were identical to those used in the acute studies. Each subacute study animal was given the acute dosage once a day for each of five consecutive days (24 hours apart).

C. Mutagenicity Testing Protocols

1. Host Mediated Assay

Flow Laboratories ICR random-bred male mice were used in this study. In the acute and subacute studies ten animals, 25-30 g each, were employed at each dose level. Solvent and positive controls were run at all times. The positive control (Dimethyl nitrosamine) was run by the acute system only at a dose of 100 mg/kg for Salmonella. For yeast, ethyl methane sulfonate (EMS) intramuscularly injected at a dose of 350 mg/kg was used. The solvents used and the toxicity data are presented in the Results and Discussion section of the report.

The indicator organisms used in this study were: (1) two histidine auxotrophs [his G-46, TA-1530] of Salmonella typhimurium, and (2) a diploid strain [D-3] of Saccharomyces cerevisiae. The induction of reverse mutation was determined with the Salmonella; mitotic recombination was determined with yeast. Chemicals were evaluated directly by in vitro bacterial and yeast studies prior to, or concurrent with, the studies in mice. Animals on acute studies only were not fed the evening prior to compound administration. The Salmonella were carried in tryptone yeast extract gel, transferred weekly. They were transferred to tryptone yeast extract broth 48 hours

before use: they were transferred a second time from broth to broth 24 hours prior to use, and again 8 hours before use. The mouse inoculum was prepared by transferring 4 ml of the 8-hour broth culture to 50 ml broth bottles which had been prewarmed to 37°C. Exponential log-phase organisms were inoculated intraperitoneally into the mice approximately 2-1/2 hours later when the appropriate density indicating 3.0×10^8 cells/ml was reached. The Saccharomyces was carried in yeast complete agar. The inoculum was prepared by harvesting the organisms from the surface of the plates with sterile saline. The cells were washed three times with sterile saline and suspended in a concentration of 5.0×10^8 cells/ml. Two ml of the suspension was inoculated into each mouse intraperitoneally. Total plate counts on Salmonella were on tryptone yeast extract and for Saccharomyces on yeast complete medium.

a. Acute Study

Three dosage levels (usage, intermediate [determined as discussed previously], and LD_5) were administered orally by intubation to ten mice. Positive controls and negative vehicle controls were included in each study. All animals received 2 ml of the indicator organism intraperitoneally. Each ml contained 3.0×10^8 cells for Salmonella and 5.0×10^6 cells for Saccharomyces. Three hours later, each animal was killed and 2 ml of sterile saline was introduced intraperitoneally. As much fluid as possible was then aseptically removed from the peritoneal cavity. Dilution blanks for bacteria containing 4.5 ml of sterile saline were prepared in advance. Tenfold serial dilutions were made of each peritoneal exudate (0.5 ml exudate + 4.5 ml saline)

yielding a concentration series from 10^0 (undiluted peritoneal exudate) through 10^{-7} . For enumeration of total bacterial counts, the 10^{-6} and 10^{-7} dilutions were plated on tryptone yeast extract agar, 3 plates/sample, 0.2 ml sample/plate. Each sample was spread over the surface of the plate using a bent glass rod immersed in 95% ethanol and flamed just prior to use. In plating for the total mutant counts on minimal agar, the 10^0 dilution was used, 0.2 ml being plated on each of 5 plates. The plating procedure was identical to that followed for the tryptone yeast extract agar plates. All plates were incubated at 37°C , tryptone yeast extract agar plates for 18 hours and minimal agar plates for 40 hours. For yeast mitotic recombination, dilution blanks containing 4.5 ml of sterile saline were prepared in advance. Ten-fold serial dilutions were made of each sample yielding a series from 10^0 to 10^{-5} . Samples of 0.1 ml of the 10^{-5} , 10^{-4} , and 10^{-3} dilutions were removed and plated on complete medium (10 plates each). All plates were incubated at 30°C for 40 hours. The 10^{-5} dilutions were used to determine total populations and the 10^{-4} and 10^{-3} plates were examined after an additional 40 hours at 4°C for red sectors indicating a mutation. Bacterial scoring was calculated as follows:

Total mutants on 5 plates X appropriate exponent = CFU/ml of sample plated

(CFU is Colony Forming Units)

CFU/ml X one/dilution factor ($10^0 - 10^{-7}$) = CFU/ml in undiluted exudate.

The mutation frequency (MF) was calculated for each sample where:

$$\text{MF} = \frac{\text{total mutant cells}}{\text{total population}}$$

$$\text{MFt/MFc} = \frac{\text{MF of experimental sample}}{\text{MF of control sample}}$$

(MFt/MFc = 1.00 for control sample)



Yeast mitotic recombinants (presumptive ade 2, his 8 homozygotes) were seen as red colonies or as red sectors on a normally white yeast colony. The plates (from 10^{-4} and 10^{-3} dilutions) were scanned under the 10X lens of a dissecting scope to enumerate the red colonies and sectors. Population determinations were made from the 10^{-5} dilution plates. A recombinant frequency (RF) was calculated:

$$RF = \frac{\text{total recombinants counted}}{\text{total number colonies screened}}$$

b. Subacute Study

Similar groups of animals at each dose level received five oral doses of the test compound 24 hours apart. Within 30 minutes after the last dosing, the animals were inoculated with the test organism and handled in the same fashion as those in the acute study.

c. In Vitro Study

Cultures of S. typhimurium histidine auxotrophs (G-46 and TA-1530) were plated on appropriate media. The test compound was then added to the plate, either in the form of a microdrop of solution (0.01 to 0.25 ml) applied to a small filter paper disc resting on the agar or a small crystal applied directly to the agar. Tenfold serial dilutions of the culture were employed and plated so as not to miss the optimum cell density for mutant growth. Mutant colonies were observed and scored. Strain D-3 Saccharomyces cells at proper dilutions were shaken with the test compound, diluted, and plated at 50% survival level or above (see HMA Supplementary Materials and Methods). Red sectors were then scored and the frequency calculated after suitable incubation. Negative and positive controls were run concurrently. The positive control was EMS for Salmonella and Saccharomyces. The in vitro Salmonella tests were reported as (+) or (-) or questionable; the in vitro Saccharomyces tests were reported as sample concentrations, percent survival,



and recombinants/ 10^5 survivors. For the Saccharomyces a 50% survival level, e.g., an arbitrary 5.0% w/v test level, was used when no LD₅₀ was determinable.

2. Cytogenetic Studies

a. In Vivo Study

Ten to twelve week old, male, albino rats obtained from a closed colony (random-bred) were used. A total of 59 animals in the acute study and 18 animals in the subacute study was used, as illustrated in the following protocol.

Number of Animals Used

Acute Study

Treatment	Time Killed after Administration		
	6 hours	24 hours	48 hours
High level	5	5	5
Intermediate level	5	5	5
Low level	5	5	5
Positive control	0	0	5
Negative control	3	3	3

Subacute Study

Five doses 24 hours apart; animals killed 6 hours after last dose.

Treatment	Killed after Administration
High level	5
Intermediate level	5
Low level	5
Negative control	3

All animals were dosed by gastric intubation.

Four hours after the last compound administration, and two hours prior to killing, each animal was given 4 mg/kg of colcemid intraperitoneally in



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order to arrest the bone marrow cells in C-mitosis. Animals were killed by using CO₂, and the adhering muscle and epiphysis of one femur were removed. The marrow "plug" was removed with a tuberculin syringe and an 18 gauge needle, aspirated into 5 ml of Hanks' balanced salt solution (BSS) in a test tube and capped. The specimens were centrifuged at 1,500 RPM in a table-top centrifuge for 5 minutes, decanted, and 2 ml of hypotonic 0.5% KCl solution was added with gentle agitation to resuspend the cells. The specimens were then placed in a 37°C water bath for 20 minutes in order to swell the cells. Following centrifugation for 5 minutes at 1,500 RPM, the supernatant was decanted and 2 ml of fixative (3:1 absolute methanol: glacial acetic acid) was added. The cells were resuspended in the fixative with gentle agitation, capped, and placed at 4°C for 30 minutes. The specimens were again centrifuged, decanted, 2 ml of prepared fixative was added, and the cells were resuspended and placed at 4°C overnight.

The following day the specimens were again centrifuged, decanted and 0.3 - 0.6 ml of freshly prepared fixative was added to obtain a suitable density. The cells were resuspended and 2 - 3 drops of the suspension were allowed to drop onto a clean, dry slide held at 15° from the horizontal. As the suspension flowed to the edge of the slide, it was ignited by an alcohol burner and allowed to flame. Following ignition, the slides were allowed to dry at room temperature overnight. Duplicate slides were prepared. The slides were stained using a 5% Giemsa solution (Giemsa buffer pH 7.2) for 20 minutes, rinsed in acetone, 1:1 acetone:xylene, and placed in fresh xylene for 30 minutes. The slides were then mounted using permount (Fisher Scientific) and 24 X 50 mm coverglasses. The coverglasses were selected to be 0.17 mm \pm 0.005 mm in thickness by use of a coverglass micrometer.



The preparations were examined using Leitz Ortholux I & II microscopes with brightfield optics and xenon light sources. These specimens were scanned with 10X and 24X objectives and suitable metaphase spreads that were countable were then examined critically using 40X, 63X or 100X oil immersion flat-field apochromatic objectives. Oculars were either 12X or 16X widefield periplanatics and the tube magnification either 1X or 1.25X. The filters used were either a didymium (BG20) or a Schott IL570 $m\mu$ interference filter.

The chromosomes for each cell were counted and only diploid cells were analyzed. They were scored for chromatid gaps and breaks, chromosome gaps and breaks, reunions, cells with greater than ten aberrations, polyploidy, pulverization, and any other chromosomal aberrations which were observed. They were recorded on the currently used forms and expressed as percentages on the summary sheets. Fifty metaphase spreads were scored per animal. Mitotic indices were obtained by counting at least 500 cells and the ratio of the number of cells in mitosis/the number of cells observed was expressed as the mitotic index.

Positive controls in the acute study consisted of animals which had been given the known mutagen Triethylene Melamine (TEM) administered intraperitoneally at a level of 0.30 mg/kg. Negative controls on the acute and subacute studies consisted of the vehicle in which the compound was administered. The dosage levels, solvents and toxicity data are included in the Results and Discussion section of the report.

b. In Vitro Study

Human embryonic lung cultures (WI-38) which were negative for adventitious agents (viruses, mycoplasma) which may interfere were used. These cells were employed at passage level 19. The cells had been transferred



using 0.025% trypsin and planted in 32 oz. prescription bottles containing 40 ml of tissue culture medium. When growth was approximately 95% confluent the cells were removed from the glass using trypsin, centrifuged, and frozen in tissue culture medium containing dimethyl sulfoxide (DMSO). Cells were frozen in vials in the vapor phase of liquid nitrogen at a concentration of 2×10^6 cells/ml. When needed, the vials were removed from liquid nitrogen, quick-thawed in a 37°C water bath, washed free of DMSO, suspended in tissue culture medium (minimal essential medium [MEM] plus 1% glutamine, 200 units/ml of penicillin and 200 µg/ml of streptomycin and 15% fetal calf serum) and planted in milk dilution bottles at a concentration of 5×10^5 cells/ml. The test compound was added at three dose levels using three bottles for each level, 24 hours after planting. The dose levels required a preliminary determination of a tissue culture toxicity. This was accomplished by adding logarithmic doses of the compound in saline to a series of tubes containing 5×10^5 cells/ml which were almost confluent. The cells were examined at 24, 48, and 72 hours. Any cytopathic effect (CPE) or inhibition of mitoses was scored as toxicity. Five more closely spaced dose levels were employed within the two logarithmic dosages, the higher of which showed toxicity and the lower no effect. The solvents used and the range finding data are presented in the toxicity data report under Results and Discussion. The dose level below the lowest toxic level was employed as the high level. Logarithmic dose levels were employed for the medium and low levels.

Cells were incubated at 37°C and examined twice daily to determine when an adequate number of mitoses were present. Cells were harvested by shaking when sufficient mitoses were observed, usually 24 - 48 hours after planting, centrifuged, and fixed in absolute methanol:glacial acetic acid (3:1) for 30 minutes.



The specimens were centrifuged, decanted, and suspended in acetic acid-orcein stain (2.0%) and a drop of suspension placed on a clean dry slide. Selected coverglasses 0.17 mm in thickness were placed on the suspension and the excess stain gently expressed from the slide. The coverglasses were sealed with clear nail polish and examined immediately.

The microscopes, objectives, oculars, filters and light sources were enumerated under the metaphase description. Positive controls used were TEM (at a concentration of 0.1 mcg/ml dissolved in saline) and negative controls which consisted of the vehicle in which the test compound was dissolved, which was 0.85% saline. Data were reported on forms currently used and expressed as percentages on the anaphase summary sheets.

3. Dominant Lethal Assay

In this test, male and female random bred rats from a closed colony were employed. These animals were 10-12 weeks old at the time of use. Ten male rats were assigned to each of 5 groups; 3 dose levels selected as described above, a positive control (triethylene melamine) (TEM) and a negative control (solvent only). The positive control was administered intraperitoneally. Administration of the test compound was orally by intubation in both the acute study (1 dose) and in the subacute study (1 dose per day for 5 days). Following treatment, the males were sequentially mated to 2 female per week for 8 weeks (7 weeks in the subacute study).



Two virgin female rats were housed with a male for 5 days (Monday through Friday). These two females were removed and housed in a cage until killed. The male was rested on Saturday and Sunday and two new females introduced to the cage on Monday. It has been our experience that conception has taken place in more than 90% of the females by Friday and that the two day rest is beneficial to the male as regards subsequent weekly matings. Females were killed using CO₂ at 14 days after separating from the male, and at necropsy the uterus was examined for deciduomata (early deaths), late fetal deaths and total implantations.

Sufficient animals were provided in our experimental design to accomodate for any reduction in the number of conceptions. Each male was mated with two females per week, and this provided for an adequate number of implantations per group per week (200 minimum) for negative controls, even if there was a four-fold reduction in fertility of implantations. Results were analyzed according to the statistical procedures described in Supplementary Materials and Methods. Corpora lutea, early fetal deaths, late fetal deaths and total implantations per uterine horn were recorded on the raw data sheets, which are submitted separately.



D. Supplementary Materials and Methods

1. Host Mediated Assay In Vitro and Formulae

a. Bacterial in vitro plate tests.

This method has been published by Ames: The Detection of Chemical Mutagens with Enteric Bacteria, in Chemical Mutagens; Principles and Methods for Their Detection, Vol. 1, Chapter 9, pp. 267-282, A Hollaender, Editor, Plenum Press, New York (1971).

b. In vitro for Mitotic Recombination.

(1) Strain D-3 was grown to stationary phase on complete medium agar plates at 30°C. (3-4 days). Cells were rinsed from the plates and washed twice in saline and cell concentration determined spectro-photometrically. (A standard curve previously determined for colony forming units versus % transmittance at 545 mu was easily used).

(2) Cells from the concentration suspension were diluted appropriately into 0.067 M Phosphate buffer pH 7.2 to provide 5×10^7 cells/ml in a total of 25 ml.

(3) The test chemical was first tested for 4 hours at 30°C, with shaking, at concentrations which permitted determination of the 50% survival level. Then, if not included in the first experiment, the compound was tested again only at the 50% survival level. If 50% survival level could not be determined, the arbitrary test level of 5% w/v was used.

(4) Following treatment, cells were diluted and plated on complete agar medium for determination of total population and red sectors. Total surviving population was conveniently measured on plates of 10^{-4} and 10^{-5} dilutions using 0.2 ml per plate (5 plates)

and sectors determined on plates of 10^{-3} and 10^{-4} dilutions using 0.2 ml per plate (5 plates). Plates are incubated for 2 days at 30°C followed by a holding period of 2 days at 4°C to promote color development with limited enlargement of the colonies. Red sectors are scored by systematically scanning the plates with a dissecting microscope at 10X magnification.

- (5) The frequency of red sectors can then be calculated and may be expressed conveniently as sectors per 10^5 survivors for comparison with untreated controls.
- (6) Ethyl Methane Sulfonate (EMS) was employed as the positive control in both in vitro systems.

c. Minimal Medium (Bacteria):

Spizizen's Minimal Medium

4X Salt Solution:

(NH ₄) SO ₄	8.0 gm
K ₂ HPO ₄	56.0 gm
KH ₂ PO ₄	24.0 gm
Na Citrate	4.0 gm
Mg SO ₄	0.8 gm
Biotin	0.004 gm
H ₂ O	qs to 1 liter
Sterilize by autoclaving (121°C/15 min.)	

Medium:

4X Salt Solution	: 250 ml	
5.0% Glucose (sterile)	: 100 ml	(If histidine is added at concentration of 30 mg/liter, this becomes a complete bacterial medium.)
1.5% Bacto-agar (sterile)	: 650 ml	



2. Cytogenetics In Vitro Preparation of Anaphase Chromosomes (from Nichols, 1970)

"Anaphase preparations may be made by several methods. One convenient approach is to grow cells directly on coverslips in petri dishes. With human fibroblasts 400,000 cells added to a 22 x 40 mm coverslip in a 50 mm petri dish grown in a 5% CO₂ atmosphere in air has proved very satisfactory. When adequate numbers of mitoses are visualized directly utilizing an inverted microscope (usually 48 to 92 hrs. after planting) the coverslip is transferred to absolute ethanol for 15 minutes for fixation. They are then stained with any one of a number of suitable stains (Fuelgen, May-Grunwald-Giemsa, orcein) and attached to a slide with mounting media for evaluation. Anaphase preparations may also be prepared on cells grown in suspension or cells from a monolayer that have been put into suspension. In this instance the cells are centrifuged and fixed with the squash fixative. They are then suspended in the stain and a drop of the suspension put on the slide and covered with a coverslip. However, in this case, only the excess stain is gently expressed from under the coverslip and no squashing is carried out. In anaphase preparations no pretreatment with colchicine or hypotonic expansion is used and no technique for spreading the cells is used, so that the spindle and normal relationships of the chromosomes are not disturbed."



3. Statistical Analyses of Dominant Lethal Studies

The following statistical analyses were employed as a means of analyzing the results of the dominant lethal studies.

a. The fertility index: number of pregnant females/number of mated females with the chi-square test used to compare each treatment to the control. Armitage's trend used for linear proportions to test whether the fertility index was linearly related to arithmetic or log dose.

b. Total number of implantations: t-test used to determine significant differences between average number of implantations per pregnant female for each treatment compared to the control. Regression techniques used to determine whether the average number of implantations per female was related to the arithmetic or log dose.

c. Total number of corpora lutea: t-test used to determine significant differences between average number of corpora lutea per pregnant female for each treatment compared to the control.

d. Preimplantation losses: computed for each female by subtracting number of implantations from number of corpora lutea. Freeman-Tukey transformation used on the preimplantation losses for each female and then t-test used to compare each treatment to control. Regression technique used to determine whether the average number of preimplantation losses per female was related to the arithmetic or log dose.

e. Dead implants: treated same as preimplantation losses.

f. The proportion of females with one or more dead implants computed, each treatment compared to control by chi-square test and Armitage's trend used for linear proportions to see if proportions were linearly related to either arithmetic or log dose. Also, probit regression analysis used to determine whether the probit of the proportions was related to log dose.

g. The proportion of females with two or more dead implants computed treated same as f.

h. Dead implants/total implants: computed for each female and used Freeman-Tukey arc-sine transformation on data for each female; then used t-test to compare each treatment to control.

Historical control data was compiled on a continuous basis as studies were completed. In addition to comparing each treatment to control, as outlined above, each treatment was compared to an historical control.

In order to take variation between males into account, a nested model was used. An analyses of across weeks is also provided.

In addition to these tests, the distribution forms of the various parameters were tested in order to evaluate the appropriateness of some of the tests being used. Certain correlations between parameters may exist and were examined as one step to determine the appropriateness of models. If necessary, alternate test methods were implemented.

The results are presented in tabular form with the addition of historical control information. In addition to these tables, a written report of all findings is provided. As information became available from the on-going investigation of these data, it was reported and suggestions included for changes to the methods of analyses. The statistical reports give the level of significance using both a one-tailed and two-tailed test. Finally, a summary sheet for each study is provided.



M O D E L

$$y_{ijk} = \mu + \alpha_i + c_{ij} + e_{ijk}$$

$i = 1, 2$ Groups

$j = 1, 2, \dots, 10$ Males within each group

$k = 1, 2$ Females within Males within Groups

ASSUMPTIONS:

$$\alpha_1 + \alpha_2 = 0, \quad c_{ij} \sim \text{nid}(0, \sigma_c^2),$$

$$e_{ijk} \sim \text{nid}(0, \sigma^2)$$

Males are randomly drawn from infinite population

S.U.	d.f.	S.S.	MS	E(MS)	F
TOTAL	39	$\sum \sum \sum (y_{ijk} - \bar{y} \dots)^2$			
GROUPS	1	$20 \sum (\bar{y}_{i..} - \bar{y} \dots)^2$	S_1^2	$\sigma^2 + 20\sigma_c^2 + 20\sigma_{\alpha_i}^2$	
MALES					
WITHIN GROUPS	18	$2 \sum \sum (\bar{y}_{ij.} - \bar{y}_{i..})^2$	S_2^2	$\sigma^2 + 2\sigma_c^2$	
REMAINDER	20	$\sum \sum \sum (y_{ijk} - \bar{y}_{ij.})^2$	S_3^2	σ^2	

E. References

Host-Mediated Assay

1. Gabridge, M. G., Denuzio, A. and Legator, M. S.: Nature 221:68, 1969.
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F. Abbreviations

mu = micron

mcg = ug = microgram

g = gram

kg = kilogram

ml = milliliter

rpm = revolutions per minute

$^{\circ}\text{C}$ = degrees centigrade

pH = power of the hydrogen ion concentration to the base 10

M = molar solution

conc. = concentration

MTD = maximum tolerated dosage = High = LD_{50} if determined or else exceedingly high dose, such as 5 g/kg

INT = intermediate = medium level

USE = usage level if known = low level

BSS = balanced salt solution

C-metaphase = cells arrested in metaphase, using colchine or colcemid

LD_{50} = that dosage which produced 50% mortality in the group of animals treated

LD_5 = that dosage which produced 5% mortality in the group of animals treated

NC = negative control

PC = positive control

AU = acute usage level (low level)

AI = acute intermediate level (medium level)

AMTD = acute maximum tolerated dose level (LD_{50} level, high level)



SAU = subacute usage level (low level)
 SAI = subacute intermediate level (medium level)
 SA LD₅ = subacute LD₅ level (MTD level, high level)
 CO₂ = carbon dioxide
 DMN = Dimethyl nitrosamine
 EMS = Ethyl methane sulfonate
 TEM = Triethylene melamine
 DMSO = Dimethyl sulfoxide
 MEM = minimal essential medium (Eagle's)
 CPE = cytopathic effect
 his = histidine marker
 D-3 = mitotic recombinant strain of saccharomyces
 mf = mean mutant frequency
 MFt/MFc = mean mutant frequency of the test compound group compared to
 mean mutant frequency of the negative control group
 CFU = colony forming units
 WI-38 = code name for a strain of human embryonic lung tissue culture cells
 Rec x 10⁵ = mitotic recombinants x 10⁵
 Mean B/A = mean frequency
 tot. scr. = total scored
 tot. = total
 χ^2 = a test of variation in the data from the computed regression line.
 Tested in these studies at the 5% level
 Aberr. = aberrations
 Frag. = fragment
 HMA = host mediated assay



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